

~~CANCELLED~~

The Journal OF THE Ministry of Agriculture

JANUARY, 1920.

EDITOR: HAROLD C. LONG, B.Sc. (Edin.).

PRINCIPAL CONTENTS.

(For Complete List of Contents see page xv.)

	PAGE
Editorial Notes - - - - -	961
Interim Report of the Royal Commission on Agriculture Report on the Proposed Electrolytic Treatment of Seeds (Wolfryn Process) before Sowing. <i>E. J. Russell,</i> <i>D.Sc., F.R.S.</i> - - - - -	967
The Value of Lupins in the Cultivation of poor Light Land. <i>A. W. Oldershaw, M.B.E., B.Sc.</i> - - - - -	971
The Food of the Nightjar. <i>Walter E. Collinge, D.Sc., F.L.S.</i> -	982
The Warble Fly - - - - -	992
"Stripe" Disease of Tomatoes. <i>S. G. Paine and W. F. Bewley</i>	995
Home-Grown Sugar - - - - -	998
The Fowler Self-Lift Stetch Plough - - - - -	1000
Final Report of the Committee on the Production and Distribution of Milk - - - - -	1002
Cost of Milk Production - - - - -	1005
Notes on Manures for February. <i>From the Rothamsted</i> <i>Experimental Station</i> - - - - -	1009
Notes on Feeding Stuffs for February. <i>From the Animal</i> <i>Nutrition Institute, Cambridge University</i> - - - - -	1011
Apple Packing at the Eastern Counties Commercial Fruit Show - - - - -	1017
Seed Potato Regulations - - - - -	1020
Winter Feeding of Bees - - - - -	1023
Parliamentary Replies to Questions affecting Agriculture	1024
Official Notices and Circulars - - - - -	1025
	1028



LONDON

PRINTED UNDER THE AUTHORITY OF HIS MAJESTY'S STATIONERY OFFICE,
AND PUBLISHED BY THE MINISTRY OF AGRICULTURE AND FISHERIES.

(To be obtained from the Ministry Offices, 3, St. James's Square, London, S.W. 1.)

EDITORIAL AND
PUBLISHING OFFICES:
3, ST. JAMES'S SQUARE,
LONDON, S.W. 1.

MONTHLY.
[PRICE SIXPENCE.]
Post free.

AGENTS FOR ADVERTISEMENTS:
G. VERNON & SONS, Ltd
38, Holborn Viaduct, E.C. 1;
56/62, South Castle Street, Liverpool.

McDOUGALL'S
PATENT
KŪR-MANGE
A CERTAIN REMEDY FOR
PARASITIC MANGE
IN
HORSES, CATTLE, DOGS, Etc.

KŪR-MANGE also destroys Lice, Fleas and other Parasites, and leaves the Skin and Coat in a clean and healthy condition.

A SPLENDID CURE FOR RINGWORM.

McDOUGALL'S
PATENT
KŪR-MANGE

IS

NON-POISONOUS.
NON-CARBOLIC.
NON-IRRITANT.

 **SUPPLIED BY THE LEADING CHEMISTS.**

IN PACKETS at 1/6 each, and **7-lb. TINS** at 15/- each.

Write for special leaflet on Parasitic Mange to Dept. "S"—

McDOUGALL BROS., Ltd.,
66/68, PORT STREET, MANCHESTER.

For Seventy Years Specialists in the Manufacture of
SHEEP DIPS, CATTLE DRESSINGS,
INSECTICIDES AND DISINFECTANTS.

Telegrams—DISINFECT, MANCHESTER.

Telephone—57 CENTRAL, MANCHESTER.

**Scientifically Bred to the Highest
Standard of Productivity.**

GARTONS

**New and Regenerated Breeds
of SPRING OATS include**

“The Captain”

(INTRODUCED BY US IN 1919).

The Earliest Oat we have introduced.

**Extraordinary Yields with short, strong straw of
excellent feeding value.**

Write for sample and Illustrated Circular to the Raisers:

GARTONS LTD.

THE ORIGINAL
SCIENTIFIC FARM
PLANT BREEDERS,

WARRINGTON

I.L.O. “ZERO” TRACTOIL.

**HEAVY BODY, BUT FLUID
IN THE COLDEST WEATHER.
THE PERFECT LUBRICANT
FOR WINTER USE** ▼ ▼ ▼

W. B. DICK & CO LTD
90 FENCHURCH ST. E.C.3.
Telephone: AVENUE, 7854.
Telegrams: DICOTTO, FEN, LONDON.

COUNTRY HOUSE AND ESTATE LIGHTING.

“ACETYLENE”

WHICH COMBINES EFFICIENCY AND SIMPLICITY WITH ECONOMY.

We have successfully installed several thousand plants during the last 25 years, and will be pleased to advise and estimate for any contemplated work.

The best light for the farmhouse. Write for particulars of The Atoz Lighting Sets:

10 Lights ... £16 0 0 | 20 Lights ... £34 0 0

The above prices include Plant, Brackets and Pendants.

PORTABLE LAMPS SUITABLE FOR FARM WORK.

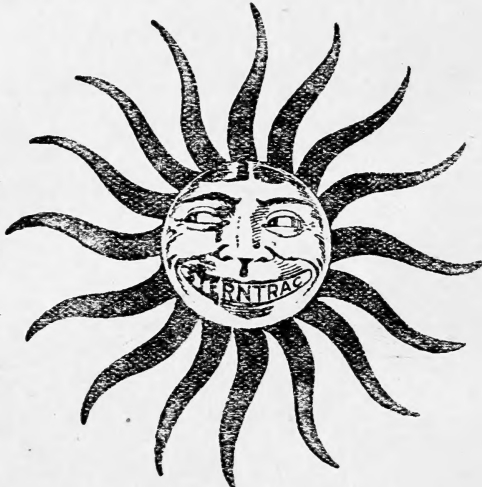
ATOZ CARBIDE

SUPPLIES NOW AVAILABLE. WRITE FOR QUOTATION.

The ACETYLENE CORPORATION, Limited,
49, VICTORIA STREET, WESTMINSTER,
LONDON, S.W.1.

The Oil that is backed with Manufacturers' guarantee to give Perfect Lubrication. Entire absence of Wear and Tear on your Tractor ensured by use of

STERNTRAC



STERNTRAC

Grades specially prepared

FOR ALL MAKES OF TRACTORS.

N.B.—Send for price list and handbook on Tractor Management.

Sole Makers, STERNS Limited, A.D. 28, Royal London House, Finsbury Square, London, E.C.2.

Best Quality & Value Obtainable

FARM
CATALOGUE
(ready Feb'y 1st)
FREE on REQUEST

WEBBS'

GARDEN
CATALOGUE
(now ready)
FREE on REQUEST

ROOT & GRASS SEEDS

USED SUCCESSFULLY BY PROGRESSIVE AGRICULTURISTS EVERYWHERE

WEBBS' ROOTS

The World's Finest Breeds

for Weight, Feeding and Keeping.

SWEDES,	2/6 lb.,	120/- bush.
TURNIPS,	1/6 lb.,	70/- bush.
MANGELS,	1/6 lb.,	160/- cwt.

UPWARDS

GRASSES and CLOVERS

For all Soils and Purposes.

ONE YEAR'S LAY, 35/- to 40/- acre.
TWO YEARS' LAY, 44/- to 52/- acre.
3 or 4 YEARS' LAY, 57/6 to 65/- acre.
PERMANENTS, 60/- to 85/- acre.

 *Estimates on Request.*

WEBB & SONS, Ltd., The King's Seedsmen, STOURBRIDGE.

SCOTTISH CO-OPERATIVE WHOLESALE SOCIETY LIMITED

Registered Offices—95, Morrison Street, GLASGOW.

Established 1868.

Annual Turnover—19½ MILLIONS.

SEED AND WARE

Potato Merchants and Growers.

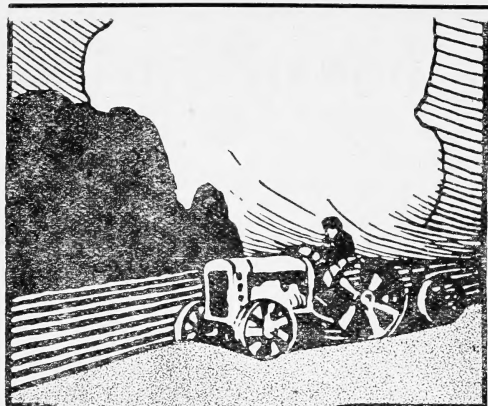
Potato Departments :

95, Morrison Street, GLASGOW,
Links Place, LEITH, and
Woodstock Street, KILMARNOCK.

Extensive Buyers of all classes of Potatoes.

Principal Markets Attended.

Enquiries Solicited.



EXPERIENCE
indicates the
best Lubricant
for your
FORDSON.

WAKEFIELD

Agricastrol
FARM TRACTOR OIL

*Write for free booklet—
Lubrication of the Fordson Tractor.*

C. C. WAKEFIELD & CO., LTD.,
Wakefield House, Cheapside, London, E.C. 2.

The Farmer's Costly Guest.

The Wages the Rat Extorts.

Farmers' and agriculturists' indignation is aroused by the announcement that rats are causing damage to the extent of over one million pounds per annum in the British Isles on farms alone.

In our huge granaries, stores, and provision shops, as well as on board nearly every cargo vessel, scores of millions of rats are nibbling and gnawing at our dearly bought and jealously guarded food stores.

Every day thousands of rats are added to the hordes that are continually gnawing at the heart of the nation, and at the present moment there are probably over 50 million rats in the British Isles alone.

They are everywhere, nibbling not only grain, but cheese, butter, eggs, fowls, and meat, and also gnawing and utterly destroying textiles and clothing and damaging thousands of pounds worth of property.

The only means to employ that will ensure a wholesale destruction is the use of a disease-producing germ such as has been proved effective in innumerable tests made at the Runcorn Laboratories of Evans Sons Lescher & Webb Ltd.

These germs or disease-producing bacteria are known as the



Liverpool Virus for Rats and Mice, produced by Evans Sons Lescher & Webb Ltd. It is virulent and particularly active, and when infection is introduced amongst a colony of rats by applying the Virus to suitable bait, the whole colony is affected and exterminated, the rats communicating a fatal intestinal disease to one another and in most cases being speedily obliterated. The Virus has no effect upon human beings or domestic animals, and the disease produced is of a nature that compels the rats or mice to come into the open air to die, thus causing no unpleasant smells.

Liverpool Virus for Rats is supplied on bait ready for use in 2/6 and 6/- tins, for Mice in 1/6 tins. In this form the Virus involves no trouble in use, it can, however, be obtained without bait if required, in 2/6 and 8/- tubes for Rats, and 1/6 tubes for Mice.

Evans Sons Lescher & Webb Ltd., 56, Hanover Street, Liverpool, will supply at the above prices postage paid, and will gladly advise any large users or institutions on any matter connected with the extermination of rodents, and welcome correspondence as to procedure in special circumstances.

The Virus may also be obtained from Chemists and all branches of Boots.

Φ F I



"The 'Glasgow' undergoing the dynamometer test."

The Lincoln Tractor Trials

Extract from the "COMMERCIAL MOTOR," 30/9/19.

"Some of the Tractors attracted more attention than others judging by the crowds following them, among them was the 'GLASGOW' which pulled very well indeed. It was noted in the case of the 'GLASGOW' Tractor that owing to its three-wheel drive no slip whatever occurred. This will tend to show that, especially in the case of small and light tractors, the all-wheel drive has certain advantages if properly designed, so that the effect of the skidding of one wheel will not take all the power from the others."

"GLASGOW" FARM TRACTOR

The "GLASGOW" will climb and pull a plough anywhere. It cannot turn over. It will not dig in, tip up, slip or skid—points of superiority, due to all its three wheels being driven. It is made by an old established British engineering firm who have long been associated with agriculture.

Write for illustrated descriptive booklet L2 to the Sole Concessionaires
for the British Empire (excepting Canada):

**BRITISH·MOTOR·TRADING
CORPORATION LTD**

20, 21, 22, KING STREET, ST. JAMES,' LONDON, S.W. 1
AND AT BIRMINGHAM, MANCHESTER, NEWCASTLE AND GLASGOW.

ANGLO'S VAPORISING OIL

FOR

Agricultural Tractors, &c.

TAXIBUS SPIRIT

in the Silver Can

FOR

All Commercial Vehicles, Tractors, &c.

PRATT'S PERFECTION SPIRIT

in the Green Can

FOR

Motor Cars.

ANGLO-AMERICAN OIL CO.

LIMITED,

36, QUEEN ANNE'S GATE,

LONDON, S.W. 1.

Branches and Depots throughout the United Kingdom.

THE

Austin

FARM TRACTOR.

Because it works faster, better and more continuously ;
because expense stops when the machine stops ; because it is
a one man (or girl) outfit ; and because it goes wherever a
horse can, and does the work of 6 or 7 horses into the bargain
—the Austin Tractor is prime favourite with those farmers
who know efficient equipment means better crops at lower cost.

THE AUSTIN MOTOR CO., LTD.,

Head Office : - NORTHFIELD BIRMINGHAM.

Telephone :

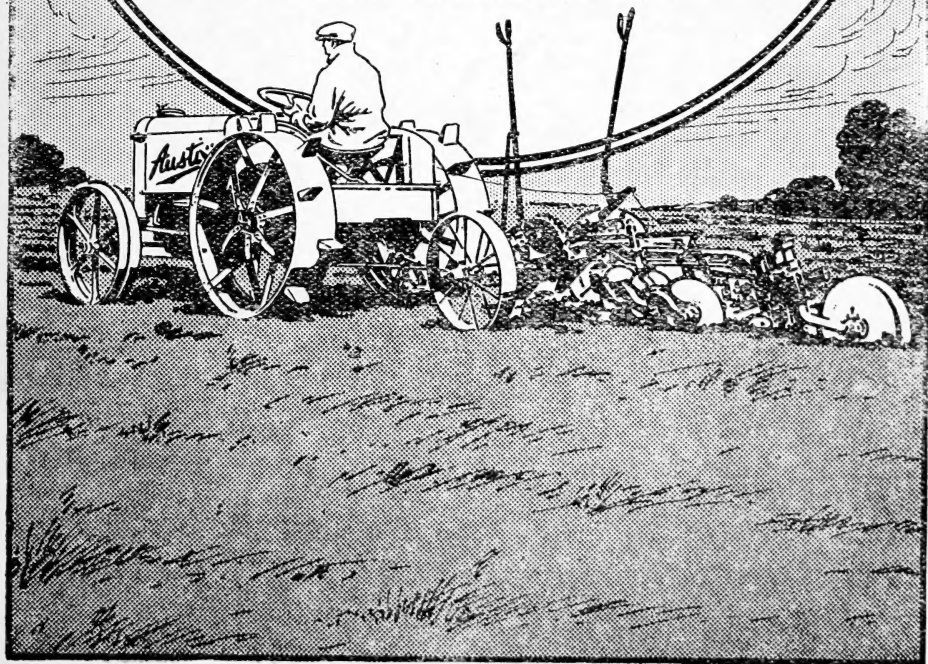
King's Norton 230.

Telegrams :

"Speedily, Northfield."

LONDON : 479-483, OXFORD ST., W.1 | And at PARIS

MANCHESTER : 130, DEANSGATE. | and BRUSSELS.



The Fertiliser "par excellence."
NITRATE OF SODA.

Importers and Merchants,

W. MONTGOMERY & CO., LTD.,

63, Mark Lane, London, E.C. 3,

AND

[ST. STEPHEN'S CHAMBERS, BRISTOL.

STOCKS IN VARIOUS ENGLISH PORTS.

TELEPHONE NO.
254 AVENUE.

TELEGRAMS:
"MARTABAN, FEN, LONDON."

SACKS & BAGS
AND JUTE GOODS
OF ALL DESCRIPTIONS.

For all purposes. For Home and Foreign Markets.

J. DE PAIVA & CO.,

(Principal—P. PARNHAM.)

11 k, Drury Lane, LIVERPOOL, England.

Telegrams: "Depaiva, Liverpool."

Telephone: 1343 and 1363 Central.

London Office:

165, Mansion House Chambers, 11, Queen Victoria Street, London, E.C. 4.

TRADE



MARK.

SPECIAL

(COMPOUND)

FERTILISERS

SUPPLY

Ammonia, Phosphates & Potash

in suitable proportions for the various crops.

CONCENTRATED FERTILISER

COMPOUND	”	(FOR ALL CROPS).
MANGOLD	”	
POTATO	”	
CORN, OAT & BARLEY	”	
TURNIP	”	
GRASS	”	

WE ARE ALSO OFFERING:—

DISSOLVED BONE COMPOUND

SUPERPHOSPHATES

POTASSIC SUPERPHOSPHATE

BONE MEAL

BONE FLOUR

BASIC SLAG (ANCHOR BRAND)

SYLVINITE (FRENCH KAINIT)

OUR OWN
GRINDING.

APPLY TO AGENTS, OR TO—

THE ANGLO-CONTINENTAL GUANO WORKS,

LIMITED,

DOCK HOUSE, BILLITER STREET, LONDON, E.C. 3.

VEGETABLE SEEDS

FOR

ALLOTMENT HOLDERS,
SMALLHOLDERS,
FARMERS,

THE GENTLEMAN'S GARDEN

AND

THE COTTAGER'S GARDEN.

THE

AGRICULTURAL
WHOLESALE
SOCIETY, Ltd.

Invites enquiries from any Co-operative Society in
England and Wales whose members require Seeds of
the very highest quality.

A.W.S.,

ST. LAWRENCE HOUSE,

48, MARK LANE, LONDON, E.C. 3.

THE SUPER LIME-SULPHUR WASH.

**“STICTITE”
TREE-BANDING
COMPOUND.**

Prices and particulars
gladly furnished on
request.

THE BEST WINTER WASH.

Always of Uniform Strength,
Clear and of Standard
Gravity, 1'300.

AGENTS EVERYWHERE.

Write to Sole Proprietors
and Manufacturers

30, Beltring, Paddock Wood, Kent

“LIMSUL”

BRITAIN'S BEST BINDER TWINES

**“ROBIN HOOD” AND
“ROB ROY” BRANDS.**

**First Class
Quality.**

**Always
Reliable.**

**British
Make.**

**Try our Famous
“ROBIN HOOD” MANILLA HAY BAND.**

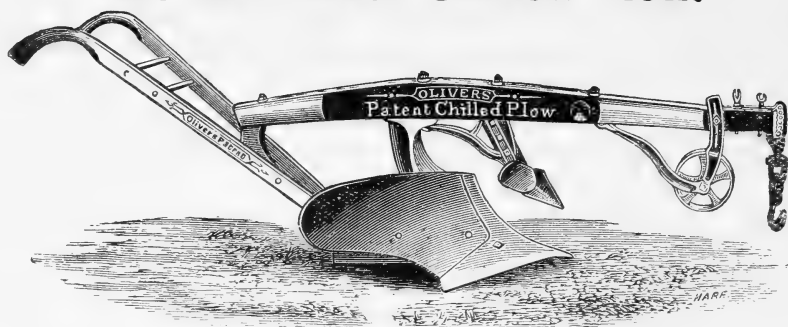
ALSO

Manilla, Hemp and Wire Ropes for all purposes.

**R. HOOD HAGGIE & SON, Ltd.,
NEWCASTLE-ON-TYNE.**

(Established 1789.)

SAVE TIME and Labour by Plowing with the No. 40x Oliver Chilled Plow.

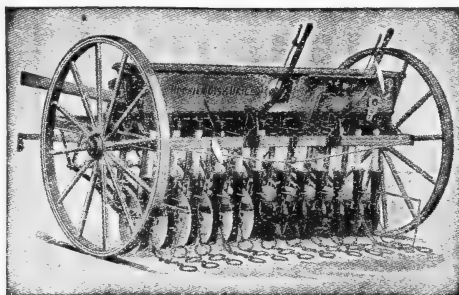


Supplied with either single wheel or double wheels, Knife coulter or Jointer

SAVE SEED by putting in your Crops with the Hoosier Disc Grain Drill.

12 Row 6 in. apart.
13 Row 7 in. apart.
15 Row 6 in. apart.

Can sow up to 7
bushels per acre
without changing
sprockets



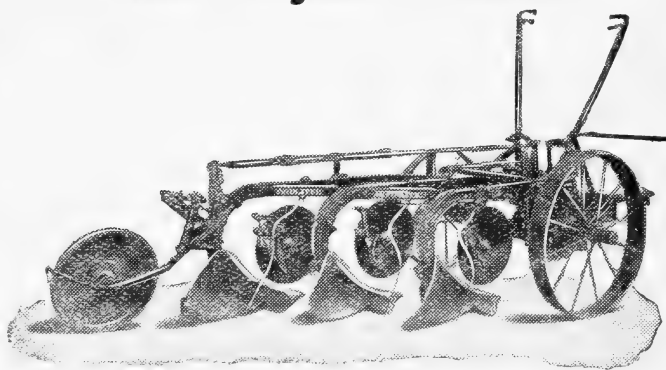
All steel Frame.

Land Marker.

Geared on both sides,
allowing one half of
the box to be in use
if required.

SAVE POWER by hitching a No. 78 Oliver Plow to your Tractor.

Makes an
Ideal
ONE-MAN
Outfit with
ANY
Tractor.



Positive Self
Lift.

Easy
Draught.

Sits to its
Work.

Three furrow
or
Two furrow.

The 3 Furrow Plow is easily converted into a 2 Furrow.

IMMEDIATE DELIVERY OF ANY OF THE ABOVE IMPLEMENTS.

JOHN WALLACE & SONS, Ltd.,
Dennistoun, GLASGOW.

MINISTRY OF AGRICULTURE AND FISHERIES.

INTERNATIONAL INSTITUTE OF AGRICULTURE.

AMENDED RATES OF PUBLICATIONS FOR SALE.

The International Institute of Agriculture gives notice of amended rates for the publications for which the Ministry act as agents. Commencing with the issue for January, 1920, the rates, including postage, will be as follows :—

	Annual subscriptions.		Single numbers.	
	s.	d.	s.	d.
1. International Crop Report and Agricultural Statistics ...	9	6	1	2
2. Documentary Leaflets ...	6	4	1	7
Annual subscription for 1 and 2	14	3	—	
3. International Review of the Science and Practice of Agriculture	14	3	1	7
4. International Review of Agri- cultural Economics ...	14	3	1	7
Aggregate subscription for the above 4 publications	35	8	—	

It should be noted that the publication "Documentary Leaflets" comprises the half-yearly *Statistical Notes on the Cereals*, the *International Trade in Concentrated Cattle Foods* (yearly) and the *International Trade in Fertilisers and Chemical Products used in Agriculture* (yearly), all three until recently issued separately. The Documentary Leaflets also supply statistics, from time to time available, as to production, trade and prices of various articles.

The sums mentioned should be forwarded to the Secretary, Ministry of Agriculture and Fisheries, 3, St. James's Square, London, S.W. 1.

SOW ONLY “ BETTER CROPS ” SEEDS.

EVERY PACKET GUARANTEED.

TOOGOOD'S GUARANTEED GARDEN SEEDS help to make your Garden trouble-proof. They never fail from lack of vigour or vitality. The Gardener who sows them tells his friends he has had a lucky season. This is how we ensure it.

EVERY packet of Seeds ordered from our Free Guide to Garden Wisdom and Guaranteed Garden Seeds MUST grow for YOU and please you or YOU WILL GET IT REPLACED FREELY.

FREE GUIDE FOR YOU.

Write To-day

for an absolutely FREE copy of our beautifully illustrated 160-page “GUIDE TO GARDEN WISDOM AND GUARANTEED GARDEN SEEDS”; and look into the matter for yourself. That is the good-sense way. Postcard will do; and there is no obligation of any sort. Just address us personally:

TOOGOOD & SONS,
Seedsmen to H.M. the King, and Growers of “Better Crops” Seeds only,
SOUTHAMPTON.

**CHAS.
PAGE
& Co., LTD.,
47-51, King William St.,
LONDON, E.C. 4.**

TELEGRAMS:

Inland: “Paganini, Cannon, London.”

Foreign: “Paganini, London.”

N H₃

P₂ O₅

K₂ O

TELEPHONE:

Avenue 1729

(3 lines).

CONTENTS.

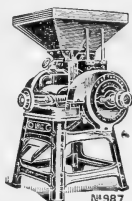
	PAGE
EDITORIAL NOTES	961
Agriculture and Legislation in 1919—The Ministry of Agriculture and Fisheries Act—The Forestry Act, 1919—Interim Report of the Royal Commission on Agriculture.	
INTERIM REPORT OF THE ROYAL COMMISSION ON AGRICULTURE ...	967
REPORT ON THE PROPOSED ELECTROLYTIC TREATMENT OF SEEDS (WOLFRYN PROCESS) BEFORE SOWING. <i>E. J. Russell, D.Sc., F.R.S.</i>	971
THE VALUE OF LUPINS IN THE CULTIVATION OF POOR LIGHT LAND. <i>A. W. Oldershaw, M.B.E., B.Sc.</i>	982
THE FOOD OF THE NIGHTJAR. <i>Walter E. Collinge, D.Sc., F.L.S.</i> ...	992
THE WARBLE FLY	995
"STRIPE" DISEASE OF TOMATOES. <i>S. G. Paine and W. F. Bewley</i> ...	998
HOME-GROWN SUGAR	1000
THE FOWLER SELF-LIFT STETCH PLOUGH	1002
FINAL REPORT OF THE COMMITTEE ON THE PRODUCTION AND DISTRIBUTION OF MILK	1005
COST OF MILK PRODUCTION	1009
NOTES ON MANURES FOR FEBRUARY. <i>From the Rothamsted Experimental Station</i>	1011
NOTES ON FEEDING STUFFS FOR FEBRUARY. <i>From the Animal Nutrition Institute, Cambridge University</i>	1017
APPLE PACKING AT THE EASTERN COUNTIES COMMERCIAL FRUIT SHOW	1020
SEED POTATO REGULATIONS	1023
WINTER FEEDING OF BEES	1024
PARLIAMENTARY REPLIES TO QUESTIONS AFFECTING AGRICULTURE ...	1025
OFFICIAL NOTICES AND CIRCULARS	1028
Appointment of Minister of Agriculture—The Rats and Mice (Destruction) Act, 1919—Present Position of Land Settlement—Loans to Tenants of Small Holdings under the Land Settlement (Facilities) Act, 1919—Potatoes Order, 1919: Amendment—The British Onions Order, 1918—The Cheese (Distribution) Order, 1918—Egg Prices—The Horse and Poultry Mixtures Order, 1917—Poultry and Game (Prices) Order, 1918—American Gooseberry Mildew—Louping-ill in Sheep—The Pirbright Cattle Testing Station: Mischievous Rumours denied—How to Redeem Tithe—Common Lands and how to protect them—A Farm School for Suffolk: A Gift from Lord Iveagh—Report of the Work of the Government Laboratory, 1918-1919—Leaflets issued by the Ministry—Constitution of the Forestry Commission—By-laws affecting the Breeding of Pigs and Poultry—Special Reports on the Mineral Resources of Great Britain—De-control of Dairy Products—Control of Home Cheese—Withdrawal of Allotments for use for Building Purposes—Double Dipping of Sheep—Foot and Mouth Disease—Rabies—Essays on Agriculture for the National Eisteddfod of Wales, 1920—Journal Errata.	
Notices of Books	1046
Notes on Crop Prospects and Live Stock Abroad	1047
Report of the International Institute of Agriculture—Finland—New Zealand—Live Stock in Canada.	
Agricultural Conditions in England and Wales on 1st January	1048
Agricultural Labour in England and Wales during December	1048
Prices of Corn and Agricultural Produce... ..	1049
Diseases of Animals Acts	1055
Weather in England during December	1056

Any of the Articles in this Journal may be reproduced in any registered newspaper or public periodical without special permission, provided that the source is acknowledged in each case.

The Ministry do not accept responsibility for the views expressed and the statements made by contributors, nor for any statements made in the advertisement columns of this Journal.

TURNER'S CRUSHING AND GRINDING MILLS

FOR THE
ESTATE,
FARM,
STABLE ETC.



Combined Crushing
and Grinding Mill.

Two Processes in
One Mill.

The most dependable
Mills on the market
for dealing with all
kinds of grain.

Catalogues free
on application.

E. R. & F. TURNER, L^{TD}, IPSWICH.



"THE BEST"

for WAGGONS
ENGINES
MACHINES
AND ALL PURPOSES

Qualities	M.	D.	A.K.	A.C.
Per square yard	4/6	6/6	8/-	9/

Carriage paid orders 40/.

Five per cent. discount for cash.

*Illustrated Price List post free from the
Sole Manufacturers:*

J. RANDS & JEKELL

—IPSWICH

RICK CLOTH, STACK SHEET
AND WATERPROOF COVER
MANUFACTURERS TO H.M. THE KING.

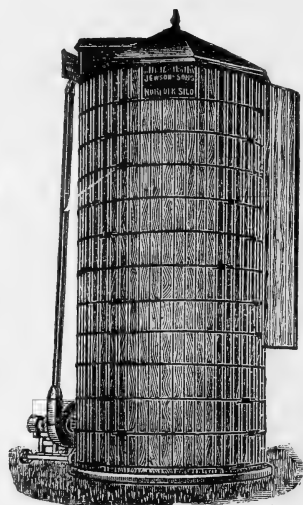
USE

The Creosoted Stave

NORFOLK SILO

and produce

MILK

 under 1/- per gallon.


Particulars and Prices of—

JEWSON & SONS, L^{TD}.

Head Office—NORWICH.

THE JOURNAL

OF THE

MINISTRY OF AGRICULTURE

Vol. XXVI. No. 10.

JANUARY, 1920.

EDITORIAL NOTES.

As far as the past year is concerned agriculturists may be pardoned if they speak of it as *annus mirabilis*, though perhaps

**Agriculture
and Legislation
in 1919.**

all its fruits are in a way the ripening harvest of the Corn Production Act. In introducing that measure the Prime Minister announced the coming of the changes for which the year 1919 has paved the way. After something like forty years in the wilderness of national indifference and neglect, agriculture received special consideration, and the Government has undertaken to provide legislation for its most pressing needs. Now we are able to see the national policy taking shape. Five Acts of Parliament affecting agricultural interests have been successfully carried through. They are the Land Settlement (Facilities) Act, the Forestry Act, the Agricultural Sales (Restriction of Notices to Quit) Act, the Rats and Mice (Destruction) Act, and the Ministry of Agriculture and Fisheries Act. Regarded as parts of a comprehensive national programme it will be seen that all these measures serve in their own fashion to strengthen the position of agriculture in England. They provide the necessary machinery for developments that are regarded as necessary in the best interests not only of agricultural but of industrial England, which must, perforce, depend to a large extent upon the prosperity of British farming. When we come to consider the normal pace of legislative progress it is clear that we have seen in 1919 developments to which no preceding year within the limits of living memory can afford a parallel. At the same time it is well to remember that the legislative programme is by no means exhausted by what has gone before. Indeed, the Acts to which Parliament has already given approval are, in a way, the prelude to still wider measures. The Interim Report of the Royal Commission (see pp. 964 and 967) provides a

basis for legislation that will guarantee a minimum return for the farmers' cereal crops. The Milk and Dairies Act passed in 1915 will come into operation within twelve months after the formal termination of the War. A Seeds and Weeds Bill is now before the House of Commons and will, it is hoped, become law by harvest time. Finally, as stated in the following note, the old Board of Agriculture have succeeded to the status of a First Class Department and will be known in future as the Ministry of Agriculture, with wider powers and larger provisions for their exercise. Whatever the difficulties before agriculturists to-day—and nobody would endeavour to minimise them—it is clear that the year behind us has accomplished much towards the clearing of the outlook and that the year before us promises to do still more.

* * * * *

THE Ministry of Agriculture and Fisheries Bill, which was originally called the "Agriculture (Councils) Bill," has passed into law. In brief, the Act substitutes

**The Ministry of
Agriculture
and Fisheries
Act.**

a Minister of Agriculture and Fisheries for the Board of Agriculture and Fisheries, sets up Councils of Agriculture for England and Wales and an Agricultural Advisory Committee for both countries, defines their powers, duties and constitution, and amends the Board of Agriculture and Fisheries Acts from 1889-1909. The Act also establishes Agricultural Committees on which executive powers can be conferred in the counties of England and Wales, to which Committees the duties of the County Councils appertaining to agriculture will stand referred. These important new bodies have been designed to give expression to the agricultural interests of the two countries; they afford a complete answer to any suggestion that the Act will tend to create a central bureaucracy in London. The County Committees will be appointed partly by the County Councils and partly by the Ministry; the Advisory Councils will be representative of the County Committees and in part nominated by the Ministry. To outward seeming the Act is one of purely local and personal significance, but, seen with a larger vision, it becomes part of the great agricultural development that the Government propose to bring about. The old Board had less than sufficient status for the work they are asked to undertake, which is nothing less than the care of what the Prime Minister has called "our greatest national industry."

Now that the paramount claims of agriculture have been realised by all who have eyes to see and intelligence to understand, the handling of agricultural questions must be carried out in a fashion befitting their importance to the nation. On this account it has been found necessary to raise the status of the old Board and to extend their Powers until they are adequate to the needs of the Country and the times we live in.

* * * * *

THE passing of the Forestry Act, which came into force on 1st September last, has created comparatively little attention, but the Act itself is of far-reaching importance. Eight Forestry Commissioners (five of them unpaid) are appointed to serve for

**The Forestry Act,
1919.**

five years and are eligible for reappointment (see p. 1039). They are charged with the general duty of promoting the interests of forestry, the development of afforestation and the production and supply of timber in the United Kingdom. They have taken over the powers and duties of the Ministry of Agriculture and Fisheries, the Board of Agriculture for Scotland and the Department of Agriculture and Technical Instruction for Ireland in so far as these relate to forestry and in so far as the Destructive Insects and Pests Acts of 1877 and 1907 relate to forest trees and timber. One of the unpaid Commissioners will be a member of the Commons House of Parliament (Mr. L. Forestier-Walker, M.P., has received the appointment under this Clause). The position of the Commissioner appointed will be similar to that of the Charity Commissioner in the House. He will answer all questions relating to forestry. The Commissioners, subject to Treasury direction, may purchase or take on lease and hold any land suitable for a Forest Station, and may plant and manage it. They may sell or let or exchange any land which has proved unnecessary or unsuitable for their purpose, but before acquiring, selling, or otherwise disposing of land the Commissioners shall consult the appropriate Agricultural Department, and if selling or disposing of land shall give that Department an opportunity of acquiring the same. (The appropriate Agricultural Department in England and Wales is the Ministry of Agriculture and Fisheries, in Scotland the Board of Agriculture for Scotland, and in Ireland the Department of Agriculture and Technical Instruction for Ireland).

The Commissioners may acquire standing timber and lands for the purpose of a Forest Station. They may undertake the management or supervision of woods and forests; establish or carry on or aid woodland industry; undertake statistical

and educational work relating to forestry ; conduct inquiries, experiments and research ; and take such steps as they think necessary for the purpose of securing an adequate supply of timber in the United Kingdom and of promoting the production of timber in His Majesty's Dominions. Other powers the Commissioners hold are for the prevention of damage by rabbits and vermin ; the appointment of Assistant Commissioners, and the compulsory acquisition of land. A Forestry Fund is established out of moneys, amounting to £3,500,000, to be provided by Parliament, and to be expended during the first ten years. Any sums received by the Commissioners from the sale of timber or any transactions carried out by them in the exercise of their powers and duties will be credited to that Fund. Commissioners will present an Annual Report of their proceedings to both Houses of Parliament.

* * * * *

THE Commissioners were unable to present their Interim Report by 30th September as requested, but they reported on the 10th of December last, limiting their

**Interim Report of
the Royal
Commission on
Agriculture.**

views to the question of whether the guarantees given to farmers under Part I. of the Corn Production Act, 1917, should be continued or not, and if continued, whether any alteration is required either in their amount or in the conditions attached to them. The Report (see also p. 967), though brief, contains an interesting review of agricultural conditions since 1870, and some account of the Committees set up by Lord Selborne, then President of the Board of Agriculture, in June, 1915, and July, 1915, together with the Report of the Committee appointed by the Prime Minister under the chairmanship of Lord Selborne in August, 1916. It may be remembered that the Committee of July, 1915, expressed the opinion that as a result of the War the nation might decide that "national security demands a substantial increase in the agricultural output of this country." The Committee over which Lord Selborne presided recommended in January, 1917 (1) that certain minimum prices for wheat and oats should be guaranteed ; (2) that a minimum wage for agricultural labour should be established and an Agricultural Wages Board set up ; and (3) that the Board of Agriculture should be empowered to supersede owners temporarily or even dispossess occupiers of land which was being badly managed or cultivated. Upon this last Report the Corn Production Act of 1917 was based.

The Interim Report of the Royal Commission makes the following recommendations :—

- (1) That, subject to the conditions set out in the following paragraphs, minimum prices for wheat, barley, and oats grown in Great Britain be guaranteed by the State, on the same principle and conditions as are laid down in Part I. of the Corn Production Act, 1917, the producer being allowed an unrestricted market for his produce, but the State retaining the right to control prices in case of national emergency.
- (2) That barley should be dealt with in the same manner as wheat under Section 1 of the Corn Production Act, payment of four times the difference between the average price as defined in the Act and the guaranteed minimum price per quarter being made in respect of that cereal.
- (3) That for the grain crops of 1920 and subsequent years the guarantees be calculated from year to year on a sliding scale based on the average bare costs of cereal production of the preceding year, rent being disregarded for this purpose ; and that the datum line to which increases or decreases in the average costs of the 1920 grain crops above or below those of 1919 should be applied, shall be 68s. per quarter of 504 lb. of wheat, 59s. per quarter of 448 lb. of barley, and 46s. per quarter of 336 lb. of oats.
- (4) That the guarantees be continued until Parliament otherwise decides, subject to not less than four years' notice of withdrawal being given.
- (5) That, if found necessary, the powers under Part IV. of the Corn Production Act be extended so as to enable the Boards of Agriculture or the County Committees to take effective action against any landowner or farmer who impedes or neglects to carry out the Orders issued by them for the better cultivation of the holding.
- (6) That any payment in respect of the guaranteed prices be dependent upon the production of a certificate from the Department concerned to the effect :—
 - (a) That the holding in respect of which payment under the guarantees is claimed has been well cultivated and an adequate amount of labour employed upon it, or that such labour was not available ; and

- (b) That either one-eighth part of the holding or one-fourth part of the arable land (whichever be the greater) is under cereal crop, or that so much less of the holding is under cereal crop as appears to be desirable in the public interest.

The Minority Interim Report is almost as long as the Majority Report, with which the Minority signatories find themselves unable to agree. They express the opinion that the present high cost of imported grain and the rates of exchange now operating against this country act as a substantial protective duty on the produce of British agriculture, and they point out that several competent judges consider that the unexhausted fertility in grass land was a valuable asset in the late time of war. They are not convinced that measures found necessary during war should be continued in time of peace. They do not find it possible to recommend the guarantee of prices that may render remunerative such wheat areas as are only able to produce $3\frac{1}{2}$ qr. or less to the acre. Arguments are adduced against the policy of guarantees and, finally, the Commissioners signing the Minority Report make the following three recommendations :—

- (1) That farmers be informed that they shall be left free to cultivate their land in such manner as they deem best, in accordance with the rules of good husbandry.
 - (2) That the Boards of Agriculture organise an efficient system of distribution of all available information relating to the progress and prospects of agriculture, with special reference to the course of world prices.
 - (3) That, so long as prices of cereals are controlled by the Government, the farmers be paid at prices not less than those at which the commodities controlled can be imported.
-

INTERIM REPORT OF THE ROYAL COMMISSION ON AGRICULTURE.

THE Royal Commission, which was appointed on 15th July last to inquire into the economic prospects of the agricultural industry in Great Britain with special reference to the adjustment of a balance between the prices of agricultural commodities, the cost of production, the remuneration of labour, and hours of employment, issued their Interim Report,* dated 10th December, on the 19th December. The Report shows that the Commission, which consist of 23 members, was sharply divided on the main principle with which it deals, namely, the advisability of continuing indefinitely the guarantees of minimum prices for corn on the terms and conditions laid down in the Corn Production Act, 1917. Twelve of the Commissioners were in favour of a scheme of guarantees, whilst eleven were against it. The twelve were the Chairman (Sir William Peat), Sir Wm. Ashley, Dr. C. Douglas, and Messrs. G. G. Rea, Anker Simmons, H. Overman, A. Batchelor, H. S. Cautley, K.C., M.P., E. W. Langford, G. Nicholls, E. H. Parker, and R. R. Robbins. The minority were Messrs. A. W. Ashby, G. Dallas, J. F. Duncan, Wm. Edwards, F. E. Green, J. M. Henderson, T. Henderson, T. Prosser Jones, R. V. Lennard, W. R. Smith, M.P., and R. B. Walker. Mr. H. S. Cautley, one of the signatories of the Majority Report, was in favour of the principle of guarantees, but disagreed with the scheme recommended by his colleagues for its application, and added a separate memorandum giving his reasons for such disagreement.

The main recommendation of the Report is, then, that guaranteed minimum prices should be fixed annually in respect of wheat, barley, and oats grown in Great Britain, on the same principle and conditions as are laid down in Part I. of the Corn Production Act, 1917, the producer being allowed an unrestricted market for his produce, but the State retaining the right to control prices in case of national emergency.

The basis recommended for the annual fixing of the prices is the average bare cost of cereal production in each year ending Michaelmas compared with the average bare cost in the previous year, both sets of costs to be ascertained by the Agricultural Costings Committee. The datum line to which increases or decreases in the average cost of the 1920 crop of each cereal

* Cd. 473, price 3d.

above or below those of 1919 are to be applied is recommended at 68s. per quarter of 504 lb. of wheat, 59s. per quarter of 448 lb. of barley, and 46s. per quarter of 336 lb. of oats.

The datum line figures were estimated by the Commission after considering a large body of evidence as to actual costs of cereal production in 1917-18, and raising the average bare costs for that year by the percentage of increase in costs which the evidence before them indicated had taken place between 1917-18 and 1918-19. The scheme of guarantees recommended is one which is calculated to return to the farmer in those years when world prices fall below the average costs of production an amount nearly up to his out-of-pocket expenditure in producing the crop. In other words, the guarantees are guarantees against serious loss, and are designed to add to the farmer's feeling of security so that he may be placed in a good position to undertake the breaking up of more pasture where to do so would seem a sound business proposition, or, if he has no fresh land to break up, so that he will be able to see his way to retain under the plough all the newly-broken up land which produces a fair crop.

The object of the proposed guarantees is precisely the same as that of the Corn Production Act, 1917, namely, to encourage the growth of cereals and arable cultivation. As the Report states, this object was considered and reported upon by various Committees during the War, nearly all of which were decidedly in favour of its attainment by a system of guarantees. Lord Milner's Committee, which reported in 1915,* stated that to obtain any substantial increase in the production of wheat, oats, and potatoes, it would be necessary for farmers to sacrifice the comparative certainty of their profits at that time, to change some of their methods, to alter their rotations, and to increase their area of arable cultivation, in the face of the shortage of labour then existing. It was recognised that, if they did this, they would have to run the risk not only of uncertain seasons but also of a fall in the price of wheat at the conclusion of the War, and the Committee expressed the opinion that it was essential in order to ensure a general movement in the direction of increased wheat production that a minimum price for home-grown wheat should be guaranteed for a period of several years. The Selborne Committee,† which was a sub-committee of the Reconstruction Committee, made recommendations to

* See this *Journal*, September 1915, p. 585, and November, 1915, p. 803.

† See this *Journal*, April, 1917, p. 1. A review of the Final Report of this Committee was published in the issue of this *Journal*, July, 1918, p. 385.

the same effect, and laid down the principles which were subsequently embodied in the Corn Production Act, 1917. These principles were :—

- (a) that certain minimum prices for wheat and oats should be guaranteed,
- (b) that a minimum wage for agricultural labour should be established and Agricultural Wages Boards be set up, and
- (c) that the Boards of Agriculture should be empowered temporarily to supersede or to dispossess occupiers of land which was being managed or cultivated in such a manner as seriously to affect food production.

The Commission reprint in their Report a number of extracts from the previous Committees' Reports, which reflect the strong views held that an increase of arable land is necessary from the points of view :—

- (a) of the need for ensuring, as far as possible, the safety of the food supplies of the nation in time of War ;
- (b) of the need, consequent upon the exhaustion through the War, of restoring man-power by the expansion of the rural population ;
- (c) of the need to repay the huge war debt by national economy in producing as much food as possible at home, and buying as little as possible from abroad.

The Commission point out that the descending scale of guaranteed prices for wheat and oats adopted in the Corn Production Act, 1917, viz., from 60s. to 45s. in the case of wheat, and from 38s. 6d. to 24s. in the case of oats (both for the small or Imperial quarter of 480 lb. for wheat and 312 lb. for oats) for the period 1917-1922, has proved to be too low to give any real assurance to the farmer at the present time. It may be mentioned, however, that as far as the principle of assurance of prices goes, the Government have on several occasions expressed themselves, through the speeches of the Prime Minister and the President of the Board, as strongly in favour of making the assistance to agriculture by guarantees of minimum cereal prices more adequate and lasting ; and further that the President of the Board in his speech at Shrewsbury on the 16th December stated that it was the intention of the Government to give effect to the recommendations of the Royal Commission in this connection early in the coming Session of Parliament.

In return for the advantages of the guarantees, the Royal Commission propose that the powers of oversight and control of farming operations in Part IV. of the Corn Production Act

should be extended so as to enable the Boards of Agriculture or the County Agricultural Committees to take effective action in the Courts or otherwise against any landowner or farmer who refuses or neglects to carry out the Orders issued by them for the better cultivation of the holding. The Commission state that they consider that both the owner and the occupier of land owe the duty to the State of seeing that the holding is cultivated according to the rules of good husbandry, and that no land capable of cultivation should lie unproductive or should be imperfectly cultivated. They add that they would not recommend that systems of cropping should be ordered and regulated except in time of national emergency, but that the Boards and the County Committees should be empowered to determine the proportion of each holding which should be devoted to arable farming.

They further suggest that the guarantees should not be paid except on production of a certificate authorised by the Boards to the effect :—

(a) that the holding in respect of which payment under the guarantees is claimed has been well cultivated and an adequate amount of labour employed upon it, or that such labour was not available ; and

(b) that either one-eighth part of the holding, or one-fourth part of the arable land (whichever be the greater) is under cereal crop, or that so much less of the holding is under cereal crop as appears to be desirable in the public interest.

It will be noticed that, following the principle adopted by the Government in giving guaranteed prices for the present year, a guarantee for barley, as well as for wheat and oats, is recommended. The reason given by the Commission for adding barley is that there is a considerable area of land in Great Britain on which that crop can be grown more economically than any other cereal.

The Commission recommend that the guarantees should continue in operation until Parliament otherwise decides, subject to four years' notice being given of their withdrawal should that at any time be decided upon.

The Commission propose to give consideration to other subjects in connection with which assistance might be given to farmers, before they make a Final Report. These subjects include Education, Research and Demonstration ; Drainage ; Transport ; Organisation ; Co-operation ; Amendments of the

Agricultural Holdings Acts, the Game Laws, and the basis of Local Rating ; and the need for giving further security to the tenant.

With the Interim Report is printed the Minority Report and Mr. Cautley's memorandum. The Minority Report is of considerable interest on account of the arguments it gives against the policy of guarantees. It favours the view that farmers should be left free, without guarantees, to cultivate their land in the way they deem best, and should obtain for their cereals prices not less than those at which grain is imported. They recommend also that the Boards of Agriculture should organise an efficient system of distribution of all available information relating to the progress and prospects of agriculture, with special reference to the course of world prices. Mr. Cautley's memorandum is also an interesting contribution from another point of view. He expresses himself in favour of continuous and substantial guarantees for wheat and oats, the guarantees to be based on the level of agricultural wages, *i.e.*, rising or falling with wages ; with a minimum of restriction on the farmer's freedom of action.

REPORT ON THE PROPOSED ELECTROLYTIC TREATMENT OF SEEDS (WOLFRYN PROCESS) BEFORE SOWING.

E. J. RUSSELL, D.Sc., F.R.S.,

Director of the Rothamsted Experimental Station.

DURING the past three seasons there has been offered to farmers seed treated by an electrolytic process* (Wolfryn process) which, it is claimed, causes marked increase in yield. The cost of the treatment in the case of wheat seed is about 28s. per qr., which works out at about 7s. to 10s. 6d. per acre,

* The details of the treatment are given as follows in Dr. Mercier's book :—

The grain is placed in a solution of 2½–5 per cent. (that is, 4–8 oz. to the gal.) of household salt, in a rectangular water-tight tank made of wood or cemented brick. Both ends of the tank are completely covered inside with a plate of sheet iron about 1/8th in. thick. To each iron plate a terminal is attached for affixing the wires which conduct the electric current. A tank of the following dimensions is a convenient size in which to treat up to 12 bush. at one time, viz., 6 ft. 6 in. long by 3 ft. broad by 1 ft. 6 in. deep. inside measurements.

[over.]

assuming the usual rate of seeding of about 2 to 3 bush. per acre. On this basis there is no great risk in adopting the treatment, but, on the other hand, if it does no good the money is lost.

Up to the present agricultural experts have not been particularly enthusiastic about the treatment, because samples of seed tested at colleges and experimental stations have in the main proved no better than untreated seed. Similar results have been obtained by certain farmers who have taken the trouble to weigh up their produce. This failure to obtain positive results is explained by the late Dr. Mercier, a well-known believer in the process, in the following way:—

“This was in the early days of the process, when the proper conditions were only guessed at, and when failures were frequent; and the particular experiments in question were failures. They either showed an actual loss, or no gain, or a gain so small as to be within the normal margin of error. In the light of subsequent experience it is now known that, with seed treated as these samples were treated, no benefit could be expected.” (“Manual of the Electro-chemical Treatment of Seeds,” 1919, p. 85.)

On the other hand, other farmers claim to have obtained satisfactory results, and in certain cases where the weighings were carried out by one of the assistants from the University College, Reading, there were considerable differences between crops grown from treated and from untreated seeds respectively.

The Technical Committee of the Food Production Department, therefore, decided to make such tests as were possible in a limited time to ascertain what measure of success a farmer might hope for if he had his seeds treated before sowing.

The solution is first prepared in the tank in the proportion of about 5 gal. to 1 bush. of grain, sufficient well to cover the grain, which should be occasionally turned over during treatment. Oats need $5\frac{1}{2}$ gal.

After the solution has been made ready in the tank, the grain is placed therein and submitted to an electric current of 8 watts per gal. of solution (400 watts for 50 gal., i.e., 2 amperes at 200 volts, or 4 amperes at 100 volts, and so on.)

When large quantities of grain are required to be treated at one time, several tanks are connected in series, and with increased voltage the same electric current will pass through the whole series.

After the treatment is completed the solution is run off and the grain removed from the tanks, and dried at a temperature of from 90 deg. to 100 deg. F. After the moisture has been driven out of the grain, it still remains in a swollen condition, for which due allowance must be made in drilling, otherwise a smaller quantity will be sown per acre than of the corresponding untreated grain.

In soil deficient in lime a solution of 5 per cent. calcium chloride (8 oz. to the gal.) may be used instead of a solution of household salt.

Classes of Treatment.—Broadly speaking, the various methods of treating crops to increase production may be divided into three classes :—

1. Those which are nearly always successful, such as the application of sulphate of ammonia and nitrate of soda to corn or to grass laid in for hay ; of superphosphate to swedes ; of salt and of nitrate of soda to mangolds, etc.
2. Those which apparently succeed in some cases, but fail in others.
3. Those which fail altogether to give crop increases.

The use of artificial fertilisers belongs to the first category. Methods of field trials have been devised by which an experimenter can say with comparative certainty whether or not a fertiliser or a mixture of fertilisers would yield an increase in crop, given a favourable season. He cannot say this with absolute certainty, but the odds are 25 or 30 to 1 against his being wrong. While, therefore, he may make a mistake in any particular case he will not make many mistakes in advising, say, 100 farmers.

It is comparatively easy in a short test to find whether any given process belongs to the first or second category, but it is more difficult to discover whether it belongs to the second or the third.

Broadly speaking, the results of the recent tests made at the colleges and experimental stations go to show that the electrolytic treatment of seed does not belong to the first category. In the majority of the trials the treatment has had no effect ; in some there have been gains, in others losses. On the whole there has been nothing to indicate with certainty any increase in crop. It does not, however, follow that the process necessarily belongs to category 3—the worthless class ; it may still belong to category 2. A single positive result in 100 failures would put it into this class, but obviously this would require a close examination of all the alleged successes, and, what is equally important, of all the failures, before a definite decision could be given.

Pot Experiments.—Experimental tests with treated seed were made at Rothamsted in 1918 and in 1919 ; the experiments were all made in pots, this being the most convenient method for rapid work.

To avoid misapprehension, it should be clearly understood that the vessels used are not flower pots, and that the process

is not the amateurish effort that is sometimes supposed. Further, there are no forced or unnatural conditions. In pot-culture work the conditions are made as natural as possible, but precautions are taken to obviate risk of loss by plant diseases, pests, or severe seasonal factors such as prolonged drought, excessive rain, frost, etc. It may be said that as a result conditions in pots are rather more favourable than those in the field in the ordinary run of seasons, and resemble the conditions obtaining in the field in a good season. Hence the differences shown in pot experiments are not always realised in the field: there are, for example, cases where a 20 per cent. improvement in the pots showed up as only a 10 per cent. improvement in a corresponding field test, and other cases where a treatment giving 10 per cent. improvement in the pots gave no certain improvement in the field. There are very few cases, however, where a treatment fails in the pot-culture house and then succeeds in the field.

The 1918 experiments were made with oats and barley. Soil from ordinary arable land was used. Half of the pots were left unmanured and half were sown with a mixture of artificial manures. Of the unmanured pots half were sown with treated and half with untreated seed. The results were:—

Effect of Manuring.

Average dry weight per pot of five plants. Two pots in each set.

Crop.				No Manure.	Complete Artificials.	Increase per cent. due to Manuring.
<i>Barley.</i>				<i>grams.</i>	<i>grams.</i>	
Expt. 1.	Grain	..	..	13·0	16·0	23·1
	Straw	..	..	19·6	35·6	81·6
" 2.	Grain	..	..	9·8	16·5	68·4
	Straw	..	..	17·4	33·6	93·1
<i>Oats.</i>						
Expt. 1.	Grain	..	..	9·25	13·75	48·6
	Straw	..	..	20·0	36·2	81·0
" 2.	Grain	..	..	10·4	15·8	51·9
	Straw	..	..	16·0	36·2	126·3

There were four separate tests and eight separate quantities measured, and in every case, without exception, the manuring increased the crop. This is in accordance with the statement already made that, when properly done, manuring belongs to the first category of treatment, which nearly always succeeds.

The result is entirely different, however, when the electrified seeds are compared with the untreated.

Effect of Electrolytic Treatment.

Average dry weight per pot of five plants. Two pots in each set.

—	Untreated Seed.	Electrified Seed.	Gain or Loss due to Electrolytic Treatment.
<i>Barley.</i>	<i>grams.</i>	<i>grams.</i>	
Expt. 1. Grain	13'0	9'8	Loss of 24'6 per cent.
„ 2. Grain	19'6	17'4	„ 11'2 „
„ 2. Grain	16'0	16'5	Gain of 3'1 „
„ 2. Grain	35'6	33'6	Loss of 5'6 „
<i>Oats.</i>			
Expt. 1. Grain	9'25	10'4	Gain of 12'4 per cent.
„ 2. Grain	20'0	16'0	Loss of 20'0 „
„ 2. Grain	13'75	15'8	Gain of 14'9 „
„ 2. Grain	36'2	36'2	None.

In five out of the eight cases there is no increase, in some there is a loss. Of the other three cases the slight gain of 3 per cent. is too small for any certainty as to gain to be reckoned; the other two gains might be real, but they do not in any case represent much.

The experiment was repeated in 1919 with seven different lots of wheat, part in each case being treated and part untreated. The seed was received on 20th December, 1918, and sown on 26th February, 1919. The results are set out in the order of merit, and are as follows:—

Treatment apparently advantageous.

Average dry weight per pot of five plants. Three pots in each set.

—	Untreated Seed.	Electrified Seed.	Gain or Loss due to Electrolytic Treatment.
<i>Ca. 3000 Ears ..</i>	<i>grams.</i>	<i>grams.</i>	
„ Straw	5'9	11'0	Gain of 86'4 per cent.
Ca. 2998 Ears ..	15'7	17'0	„ 8'3 „
„ Straw	4'7	6'0	„ 27'7 „
„ Straw	13'7	16'8	„ 22'6 „

Treatment ineffective.

<i>Ca. 3002 Ears ..</i>	<i>grams.</i>	<i>grams.</i>	
„ Straw	11'7	11'4	None.
	19'9	20'5	„

Treatment apparently disadvantageous.

—	Untreated Seed.	Electrified Seed.	Gain or Loss due to Electrolytic Treatment.
Ca. 2969 Ears ..	4'2	3'9	Loss of 7 per cent.
Straw	13'8	10'6	" 23 "
Ca. 2999 Ears ..	6'8	4'3	" 37 "
Straw	18'7	16'7	" 11 "
Ca. 3001 Ears ..	8'8	7'6	" 13'6 "
Straw	20'0	16'8	" 16 "
Ca. 3003 Ears ..	16'1	11'9	" 26'1 "
Straw	17'7	14'3	" 19'2 "

Out of 14 measurements in these seven different cases only four are in favour, whilst eight are against the process. It is obvious, therefore, that while a farmer using treated seed might be fortunate and obtain such a result as is shown by No. 2,998 or No. 3,000, he stands a much greater chance of gaining nothing, or even apparently of losing.

As an objection to this series of experiments it might be urged that too long an interval had elapsed between treatment of the seed and sowing. Such an objection would of course be a drawback to the treatment. In the case of winter corn one can never be sure of sowing directly the seed arrives, or even soon after: there is always the possibility of being caught by the weather. In another series of experiments, however, made by Professor Somerville at Oxford, this objection does not hold, as the seed, also treated in December, was sown on 15th, 16th, and 17th January. The results were:—

Treatment apparently advantageous.

—	Untreated Seed.	Electrified Seed.	Gain or Loss due to Electrolytic Treatment.
	<i>grams.</i>	<i>grams.</i>	
Ca. 2998 Grain	10'6	15'6	Gain of 47'2 per cent.
Straw	48'4	58'9	" 21'7 "
Ca. 3003 Grain	6'8	13'1	" 92'6 "
Straw	26'7	36'4	" 36'3 "

Treatment apparently ineffective.

Ca. 3001 Grain	9'9	10'2	None.
Straw	51'6	57'8	Gain of 12'0 per cent.
Ca. 3000 Grain	11'0	12'3	" 11'8 "
Straw	52'1	45'2	Loss of 13'2 "
Ca. 2999 Grain	9'1	10'4	Gain of 14'3 "
Straw	40'4	39'1	Loss of 3'2 "
Ca. 2969 Grain	8'6	7'6	" 11'6 "
Straw	30'9	32'9	Gain of 6'5 "

Treatment apparently disadvantageous.

—	Untreated Seed.	Electrified Seed.	Gain or Loss due to Electrolytic Treatment.
Ca. 3002 Grain Straw	12'6 53'6	7'4 42'1	Loss of 38'3 per cent. ,, 21'5 „

As there were only two pots in each set it is doubtful whether differences below 10 per cent. possess any significance. Differences below 5 per cent. are disregarded, as they are certainly within the error of the experiment.

These results are, perhaps, a little more favourable than those obtained at Rothamsted, and they are also more favourable than other results obtained at Experimental Stations. They do not, however, hold out any particular promise. Of the seven different sets, two are apparently distinctly favourable: four are doubtful. This, again, is not at all the kind of result obtained with manures, and the result agrees with the results obtained at Rothamsted in showing that the process, if it has any value, belongs to the category of uncertain methods of treatment which may or may not succeed in any given case.

Field Experiments.—As the pot experiments have shown so little promise, no field experiments have been made at Rothamsted. Some field experiments have, however, been made at the South-Eastern Agricultural College, Wye, during the season 1918-19, by Mr. Lindsay Robb, who has furnished the following figures showing the yields per acre:—

Crop.	Untreated Seed.	Electrified Seed.	Gain due to Electrolytic Treatment.
<i>Barley.</i>			
Grain (saleable) .. bush.	35'75	34'75	None.
(light)	7	8	None.
Straw and chaff .. cwt.	34	33	None.
<i>Oats (Abundance).</i>			
Grain (saleable) .. bush.	38'12	36'75	None.
(light)	9	7	None.
Straw and chaff .. cwt.	36	35	None.
<i>Oats (Black Tartarian).</i>			
Grain (saleable) .. bush.	33	34'75	None.
(light)	8	3	None.
Straw and chaff .. cwt.	30	30'5	None.

These results are quite in accordance with those of the pot experiments.

Two other trials with barley gave similar results :—

Crop.	Untreated Seed.	Treated Seed.	Gain due to Electrolytic Treatment.
Little Snoring (supervision of Cambridge University)—			
Head Corn	5 coombes 5½ stone	5 coombes 4 stone	None
Tail corn	5 "lb.	6 "lb.	None.
Cambridge University Farm—			
Crop weight per row (a) ..	121·5	121·6	None.
(b) ..	94·1	92·0	None.

Farmers' Tests.—A number of farmers are said to have used electrified seeds and to have expressed themselves as satisfied with the result. Unfortunately, few actual results are available. In two cases weighings have been sent in to the Food Production Department. The results are as follow :—

Essex—Barley, after Roots fed off with Sheep.

Crop.	Untreated Seed.	Electrified Seed.	Percentage Variation in Electrified Seed.
Barley Grain ..	46·7 lb.	21·3 lb.	Loss of 54 per cent.

Hampshire—Wheat: Yield per Plot (20 sq. yd.).

Heads.	Untreated Seed.	Electrified Seed.	Percentage Variation in Electrified Seed.
Heads	14 lb. 4 oz.	14 lb. 7 oz.	None.
Straw	12 lb. 4 oz.	13 lb. 14 oz.	Gain of 12 per cent.

In a single trial of this sort it is impossible to lay any stress on a difference of 12 per cent.

The following weighings of the crop harvested in 1918 were made on farms in Dorsetshire selected from a list supplied by the County Executive Officer. The selection was made and the weighings carried out by one of the assistants at the University College, Reading. The weights may be accepted as reliable :—

Crop.	Untreated Seed.	Electrified Seed.	Gain or Loss due to Electrolytic Treatment.
<i>Wheat—</i>			
(1) <i>after turnips fed off</i>			
Grain ..	5 qr. 40 lb.	5 qr. 480 lb.	Gain of 17 per cent.
Straw ..	29 cwt. 32 lb.	57 cwt. 96 lb.	„ 98 „
(2) <i>after swedes fed off</i>			
Grain ..	2 qr. 112 lb.	3 qr. 8 lb.	Gain of 36 per cent.
Straw ..	27 cwt. 56 lb.	26 cwt. 8 lb.	Loss of 5 „
<i>Barley—</i>			
(1) <i>after swedes fed off</i>			
Grain ..	4 qr. 88 lb.	6 qr. 92 lb.	Gain of 48 per cent.
Straw ..	33 cwt. 64 lb.	42 cwt. 76 lb.	„ 27 „
(2) <i>after wheat</i>			
Grain ..	5 qr. 10 lb.	4 qr. 428 lb.	Loss of 3 per cent.
Straw ..	34 cwt. 62 lb.	36 cwt. 68 lb.	Gain of 6 „
<i>Oats—</i>			
(1) <i>after swedes fed off</i>			
Grain ..	3 qr. 232 lb.	5 qr. 320 lb.	Gain of 61 per cent.
Straw ..	23 cwt. 104 lb.	33 cwt. 64 lb.	„ 40 „
(2) <i>after swedes fed off</i>			
Grain ..	4 qr. 316 lb.	7 qr. 128 lb.	Gain of 49 „
Straw ..	49 cwt. 52 lb.	44 cwt. 72 lb.	Loss of 10 „
(3) <i>after ley</i>			
Grain ..	9 qr. 96 lb.	10 qr.	Gain of 8 per cent.
Straw ..	63 cwt. 64 lb.	67 cwt. 16 lb.	„ 6 „

In the above table the weights per qr. are: wheat 504 lb., barley 448 lb., and oats 336 lb.

There is a striking difference between these results, from selected farms, and those obtained elsewhere: out of 7 cases 5 are positive. Two important considerations, however, have to be borne in mind.

1. The 7 cases were not all in which electrified seed was used: cases were rejected where there were indications of soil or crop irregularities. As we do not know the total numbers of successes and failures, it is impossible to say whether or not the results agree with those of the pot experiments. Supposing, for example, that there had been altogether 18 cases, but that the other 11 had given negative results, then the proportion of successes would have been the same as in the Oxford pot experiments. Without knowing the total number of sowings and how many of these gave negative results, it is impossible to say what these figures really mean.

It will be noticed, however, that in all the cases where marked successes are recorded the crop has been grown after roots fed off. This is the worst possible treatment for

experimental ground, as the land is left in a condition seriously lacking in uniformity. Crops taken after wheat or after ley, where greater uniformity in soil condition can be attained, showed no benefit from the treatment.

The writer is not, therefore, prepared to admit that these figures seriously conflict with the conclusions drawn from the pot experiments.

Seven results were sent in for crops harvested on farms in Dorsetshire in 1919. Again the weighings were made by a disinterested competent person and may be accepted, and the selection of farms was made by him from a list submitted by the proprietors. The plots weighed were usually 1 sq. perch, but in two cases they were 2 sq. perches. It is well established that single plots will not with certainty reveal differences of less than 10 per cent. or 12 per cent. The results are :—

Treatment apparently advantageous.

Crop.	Untreated Seed.	Electrified Seed.	Gain or Loss due to Electrolytic Treatment.
<i>Wheat—</i>			
(1) Grain, bush.	51	68	Gain of 33 per cent.
Straw, cwt.	40	59	" 47 "
(2) Grain, bush.	32	40	" 25 "
Straw, cwt.	26	26	None.
<i>Oats—</i>			
(3) Grain, bush.	39	43	Gain of 10 per cent.
Straw, cwt.	16	19	Gain of 18 per cent.

Treatment apparently ineffective.

<i>Wheat—</i>			
(1) Grain, bush.	35½	39	Gain of 10 per cent.
Straw, cwt.	30	28	None.
(2) Grain, bush.	41	42	None.
Straw, cwt.	28	27½	None.
<i>Oats—</i>			
(3) Grain, bush.	37	36	None.
Straw, cwt.	22	21½	None.

Treatment apparently disadvantageous.

<i>Barley—</i>			
(1) Grain, bush.	43½	36	Loss of 17 per cent.
Straw, cwt.	24	25	None.

Out of 7 cases 3 show no difference, and 1 a small gain; 2 show distinct gains and 1 a distinct loss. These results are entirely in accordance with those of the pot experiments; they indicate that the treatment cannot be relied upon to

give a successful result ; twice or possibly three times out of seven times it apparently succeeds ; once out of seven times it apparently does harm ; and in the remaining cases it does no good.

Possible Cause of the Successes.—It may be that the successes are purely accidental : on the other hand, they may be real, and the writer is inclined to think that they are. The process consists of three parts : soaking the seed in a solution of certain salts, submitting while still in the solution to an electric current, then drying at 110° F. Now it is well known that kiln-dried barley, especially after steeping, will germinate more evenly and satisfactorily than will ordinary barley. This is particularly the case if the barley contains any amount over 14 per cent. or 15 per cent. moisture, and it is also true even in a season like the present when the moisture content is below the average. Professor Stapledon has shown* that drying seed at 100° F. may improve its germination, unless germination is already very good. Anything that helps germination may be useful on land which has been folded and left in an unfavourable condition. It is possible that the drying in the treatment might be sufficient to help germination. Apparently in some cases the electrified seed made the better start. At Wye the young plants from the electrified seed, both of oats and barley, at first showed greater vigour than those from untreated seed, but the superiority soon vanished. This, however, is not usual ; at Rothamsted no such difference was seen ; in Professor Stapledon's germination tests the treated seeds were not quite so good as were the untreated. Nevertheless, the occasional help to germination derived from one or other parts of the treatment may prove of value in certain field conditions, and thus lead to a better crop than would otherwise ensue.

It is impossible to prove a negative proposition : a few unexceptional positive results outweigh any amount of negative evidence and would show that the treatment had some merit.

The failure, however, of electrified seed to give any increase in yield under the carefully controlled conditions of an experimental station trial shows that the process lacks certainty. It cannot be compared in effectiveness with manuring, which succeeds nearly every time if properly done. The writer is not prepared on present evidence to say that the process never succeeds, but the risk of failure seems so great that the farmer should look upon it as an adventure which may or may not prove profitable.

* See this *Journal*, July, 1919, p. 364.

THE VALUE OF LUPINS IN THE CULTIVATION OF POOR LIGHT LAND.*

A. W. OLDERSHAW, M.B.E., B.Sc.,

Agricultural Organiser for East Suffolk.

IN various parts of England, especially in East Anglia, there are considerable areas of very poor light land, much of which had gone out of cultivation before the War owing to the fact that it is of poor quality. Land of this type is usually very deficient of lime, and in all other necessary plant foods. In many cases no grass seeds had been sown, but a natural herbage, chiefly sorrel and poor grass, was permitted to grow.

During the War, considerable areas of this light-land "grass" were ploughed up, either voluntarily or at the instance of the War Agricultural Committees. In many cases rye was sown on the newly ploughed-out grass, usually with a fair measure of success, and there can be no doubt that the Nation's food supply was thereby considerably increased, with very little expenditure of labour. The question now requiring an answer, however, is, how can this land be kept in cultivation, in face of a higher cost of production, and every prospect of a falling price for rye? Two alternatives may be noted: (1) the land may be cultivated, or (2) it may be left in a practically derelict condition, as it will not grow an appreciable quantity of grass.

The writer for some years has had an opportunity of observing the effects of the growth of lupins upon poor light land, and has come to the conclusion that they possess certain qualities which render them of great value to occupiers of this type of land. He also believes that their usefulness is not sufficiently appreciated in this country. It is hardly necessary to mention that lupins, in common with other leguminous crops, assimilate the free nitrogen of the air. They are, however, unique, in that they produce a luxuriant crop on extremely light land.

In Suffolk, at the present time, the only variety of lupins grown to any extent is the blue lupin. Southworth, in the "Cyclopædia of Modern Agriculture," states that yellow lupins have more succulent stems and larger leaves than the blue variety. He tested the two varieties, however, and, on the whole, obtained the better results from the blue lupins. The seed germinated better, and usually produced a better crop. It has been stated that the yellow lupin grows more slowly than the

* Resumé of a paper read at the British Association (Section M), September, 1919.

blue variety, so that the seed ripens late and is consequently more difficult to save.

Lupins are grown for seed, for ploughing in green, and for folding with sheep. No statistics exist of the area under lupins in this country, but there are probably from 1,000 to 2,000 acres grown annually in East Suffolk.

Sowing.—When grown for seed, lupins are sown at the rate of $1\frac{1}{2}$ to 2 bush. of good seed per acre in April or early May. When sown towards the middle of May there is danger, in Suffolk, that the seed may not ripen satisfactorily, and in late seasons difficulty is experienced in harvesting. Thus, in 1918, lupins sown in the middle of May could not be harvested in some cases until the middle of November. When the crop is intended for seed, the middle of April is probably the most satisfactory time for sowing.

One Suffolk grower, who lives near the sea, and whose land is therefore not so liable to spring frosts, sows in March. Further inland there is considerable danger from frost if sowing takes place too early. Lupins sown in April, however, do not often suffer from frost in East Suffolk, and when grown for seed it is probably better to sow in this month than risk a late harvest by postponing sowing until the middle of May. If sown in April or early May the lupins will, in an average season, be ripe by the middle of September.

When grown for ploughing in green, or for folding with sheep, the seed may be sown at any time up to the middle of July. Usually, however, lupins are sown by the end of June.

Cutting.—Lupins intended for seed may be cut with the binder in the same way as beans. They may also be cut with a side-delivery reaper, and harvested loose. The plants hang together very well, and this latter method of cutting has the advantage of saving string, and of avoiding wear and tear of the canvasses of the binder, which are liable to be somewhat damaged by the spiny pods of the lupins.

If the lupins are tied up, they are shocked in exactly the same way as beans. In Schouwen, in Zeeland, near the mouth of the Scheldt, Boodt* states that this crop is cut loose, allowed to dry partly, and then tied up and stooked, being subsequently placed in small stacks—the smaller the better—on a base of brushwood.

From 20 to 30 bush. of seed per acre is an average crop. This must be regarded as good, when one considers the type of land upon which lupins are grown.

* *Tijdschrift der Ned. Heidemaatschappij*, March, 1918.

General.—It is worthy of note that Boodt* states that in Drente (North Holland) a gravel soil poor in humus and plant food is chosen for lupins. This soil in the late summer becomes so dry that the lupin plant dies about the middle of August. Better land is not suitable in Holland, because, especially in a wet summer, the plant continues growing too long, and its seed never ripens. In Schouwen, lupins are grown on the poorest and worst soils at the foot of the dunes.

Provided sufficient moisture is present, the plant makes a most luxuriant growth, the foliage having a characteristic dark-green hue. Even on the poorest of light land the writer has often seen a field of lupins one dense mass of green material $3\frac{1}{2}$ to 4 ft. high.

In a communication sent to the Royal Agricultural Society,† Mr. Thomas Crisp, of Butley, Suffolk, called attention to remarkable results he had obtained on poor light land by growing lupins.

Mr. Crisp was sent a sack of blue and a sack of yellow lupin seed by Baron von Nathusius of Hundisburgh, Prussia. He drilled, in 1858, one bush. of seed per acre on poor blowing sand, and in the following year, from 18 acres under lupins, he obtained 50 wagon-loads of sheaves. Mr. Crisp was of the opinion that yellow lupins are better for hay, straw, and chaff, and that the blue variety is better for seed.

Baron von Nathusius stated that in Prussia he sowed yellow lupins in June, ploughing in green, or folding with sheep. He found that the blue lupin makes excellent hay, but is difficult to dry. He also stated that the seed of both varieties was found to make excellent food for sheep and that the straw and chaff was of value for store sheep. He gave the following analysis of lupin seed :—

Water	..	..	..	..	..	14-15 per cent.
Fatty matter	..	..	..	..	..	6-7 „
Nitrogenous substances	..	..	..	..	..	33-36 „
Starch	..	..	..	..	..	26-30 „
Woody fibre	..	..	..	..	..	11-12 „
Mineral matter	..	..	..	..	..	3-4 „

In the *Journal of the Royal Agricultural Society*, 1896, Dr. Bernard Dyer gave an account of experiments conducted by Dr. Schultz, of Lupitz, Saxony. Dr. Schultz worked at the problem of improving a poor sandy soil, which contained from 0.18 to 0.26 per cent. of lime, and succeeded in greatly increasing

* Loc. cit.

† *Jour. of the Roy. Agric. Soc.*, 1859.



FIG. 1.—Blue Lupine (*Lupinus luteus*): a. Seed $\times 1\frac{1}{2}$; b. Seedling; b'. Cotyledon; c. Second stage of Seedling; d. Third stage of Seedling; e. Flowering Plant; e'. Flower $\times \frac{1}{3}$.



FIG. 2.—Lupin Plants (*a*) in flower, (*b*) with ripe pods.



FIG. 3.—A field of Lupins. In the foreground a portion of the crop has been ploughed under.

its productivity. Lupins were grown, alternating with non-leguminous plants, and to the latter, although not to the lupins, mineral manures, lime, phosphates and potash were applied. Part of a field was treated as a permanent lupin enclosure, blue lupins being grown on it continually for 25 years. The remaining part of the field was cropped with rye and potatoes. At the end of the period there was 0.087 per cent. of nitrogen in the lupin portion of the field and 0.034 per cent. on the portion where rye and potatoes were grown. Dr. Schultz estimated that a crop of blue lupins would contain as much nitrogen as 9 to 15 tons of farmyard manure. In one case, on the Lupitz estate, part of a field was planted with lupins which were ploughed in green, the lupins being sown after harvesting rye. Another part of the field was treated with about 8 tons of farmyard manure, and no lupins were grown. Potatoes were planted on the whole field next spring, and they gave the following results :—

	<i>Potatoes grown after Lupins ploughed in.</i>	<i>Potatoes grown with 8 Tons Farmyard Manure per Acre.</i>
Depth of penetration of the roots	47 in.	15 to 17 in.
Yield of potatoes per acre ..	9 tons.	6 tons.

In another case at Lupitz, rye was grown after lupins and potatoes, with the following results :—

	<i>After Lupins ploughed in.</i>	<i>After Potatoes heavily manured with Artificials.</i>	<i>On poor, recently arable Land not having lately borne Lupins.</i>
Height of rye above ground	47 to 66 in.	27 to 37 in.	20 to 25 in.
Depth of roots	45 in.	20 to 24 in.	16 in.
Yield of grain in bush. per acre (English) ..	27 bush.	12 bush.	9½ bush.

In Suffolk it is found that excellent crops of rye and frequently of oats can be grown on extremely poor, light and somewhat acid soil, after lupins which have been either folded green, ploughed in, or harvested for seed. One extensive grower, Mr. John Goddard, of Tunstall, maintains that lupins and rye could be grown on this type of land alternately for an indefinite period. Boodt also mentions that in Schouwen, this lupin rye rotation is practised successfully. Excellent crops of lupins have been observed repeatedly on land which is very poor in lime, and on which both sorrel and spurrey grow abundantly. Very few Suffolk farmers appear to have applied mineral manures to lupins, so that the question of permanently improving the fertility of the soil by this means cannot be said to have been

investigated properly in this country. The writer, in 1918, was instrumental in arranging for the application of a neutral phosphate to about 30 acres of lupins on Hinton Hall Farm, Suffolk—no potash was available owing to the War. An excellent crop of lupins resulted, and the land grew a good crop of rye in 1919.

As previously mentioned Boodt* states that in Drente an application of 4 cwt. of basic slag, and 4 cwt. of kainit per acre is found suitable as a first dressing, smaller quantities being given in subsequent years. If the soil is poor in potash more kainit should be given, as lupins greatly need potash. Boodt states that when lupins are sown for the first time in Holland, the soil requires inoculation at the rate of about 4 loads of soil, in which lupins have previously grown, per acre. This practice does not appear to have been adopted in East Anglia, and on land which has not so far as it is known grown lupins before, excellent crops have resulted without inoculation.

In Suffolk, as already stated, lupins are either ploughed in green, folded with sheep, or the seed is harvested.

During the past season (1919) the writer has seen excellent crops of rye grown after lupins ploughed in, on poor, light, sandy land adjoining the heath.

The experience of a few farmers in the cultivation of lupins may be given :—

Mr. A. M. Rope, of Leiston, Suffolk, states that he ploughed up very poor land, which had been abandoned for some years, in May or June, that he drilled lupins across the furrows, and obtained a good heavy crop and excellent rye afterwards. He has now a second crop of rye, looking fairly well, on the land. He agrees that one may grow lupins and rye alternately for some years until the land becomes too full of couch. The land in question is too poor for turnips to be grown fit for feeding to sheep.

Mr. Rope has never sown lupins so late as August, but he thinks that if sown in this month they might answer for ploughing in green provided the seed be cheap. He has often sown in June or July, after folding rye or vetches, or after working the land to clean it of couch grass. The heavy smothering crop of lupins which follows helps to keep the land clean. Mr. Rope finds that folding a good crop of lupins leaves the land in very good heart for a crop of rye. He considers that lupins will grow quite well where, owing to the absence of lime, the land is definitely acid.

Opinions are divided as to whether, from the standpoint of the succeeding crop, it is best to harvest the lupins for seed, to plough them in green, or to fold them with sheep. Mr. J. R. Grimsey, of Leiston, and Mr. F. W. C. Chartres, of Willingham, Beccles, both with extensive experience of lupin growing, consider that the best results are likely to be obtained when the seed is harvested. Mr. John Goddard, of Tunstall,

* Loc. cit.

another large grower, considers that it does not matter very much whether the crop is ploughed in green, folded or harvested. Mr. A. M. Rope, of Leiston, favours folding, but he has never ploughed in lupins green. Mr. H. P. Skeet, of Blaxhall, strongly favours ploughing in green, as compared with other methods, the lupins being drawn under the soil by means of a chain. Mr. Skeet is a great believer in ploughing in green leguminous crops as a means of improving poor, light land. He finds that comparatively little benefit to the succeeding crops results from the manure made by sheep on light land when the weather is hot, especially during July and August.

During the summer of 1919 the writer inspected two fields near Martlesham Heath, owned by Mr. E. G. Pretyma, M.P. On the first field, near the Heath, the lupins were ploughed in, whilst on the second they were harvested. The rye on the latter field was not nearly so good as that on the former field.

The question as to which proceeding is best to adopt—ploughing in green, folding, or harvesting—is one which requires further investigation. When a ready market exists for the seed, harvesting is almost certain to give the best financial results. In many cases, however, the land may require cleaning, or it may be occupied by another crop, so that it is impossible to sow the lupins early enough for the seed to ripen. In such cases folding or ploughing in green may be relied upon to improve the land considerably.

Composition of Lupins.—Very few British analyses are available. Those given by Kellner indicate that in composition green lupins resemble green vetches, but have a somewhat larger proportion of woody fibre. The grain of blue lupins contains a somewhat larger proportion of albuminoids (29 per cent.) than do beans, which only contain 25 per cent. of albuminoids. The fat content is higher than in beans, being 6 per cent. as against 1.5 per cent. in the latter. The starch equivalent is also slightly higher in the case of lupins than in beans.

Use for Feeding Purposes.—One of the difficulties in the past, in connection with the growing of lupins for seed, has been the disposal of the seed produced. The demand for the seed is limited, and hitherto no very satisfactory method of utilising it as cattle food has been found. Mr. John Goddard feeds it to sheep— $\frac{1}{2}$ bush. of lupin seed daily per 100 sheep—*i.e.*, about $\frac{1}{3}$ lb. each. This, in his experience, is the extreme quantity which can be fed safely. More than this causes paralysis. The grain is bitter, and is refused by other stock.

Mr. Goddard does not use lupins for pregnant ewes, nor does he consider them suitable for feeding to these animals.

Mr. Rope, of Leiston, has fed lupin seed to sheep, but would not venture to feed more than $\frac{1}{4}$ lb. per head daily.

Many flockmasters in Suffolk find lupins very useful for folding purposes. Sheep do well on them, especially when the seed is beginning to form in the pods, but before it gets hard. If the lupins are sown in June, the pods remain on until December, and are good feed for sheep, even when the plant is nearly black. The animals, however, take some time to get accustomed to the bitter flavour, and one should always begin gradually the feeding of lupins. Sheep also require a run on rough grass or on the heath daily, returning to the fold at night.

Possible Poisonous Properties of Lupins.—Considerable care must be taken in folding lupins, to prevent the animals from eating too large a quantity at once, or a heavy mortality may occur. Kellner* states that fodder from lupins always has a heating effect, and in some years all parts of the plant contain a deadly poison. This poison, he states, is a protein-like substance, probably due to the action of some fungus, which, favoured by the weather, migrates to the plant. He recommends feeding the lupins to a rabbit or similar animal in order to judge whether the material is safe. Steaming for four or five hours under a pressure of 60–80 lb. per square inch is, he states, necessary to destroy the poisonous properties.

The writer has been unable to trace any instance, in Suffolk, of serious poisoning from feeding green lupins. Most flockmasters using them fold with confidence, provided certain precautions are taken. Kellner appears to over-emphasise the danger of poisoning. At the same time there can be no doubt that some danger exists and that great care is necessary. If, however, lupins are mixed with other plants, such as tares and oats, the danger is small.

Whilst chemists have shown the presence of poisonous alkaloids in lupins, the losses to stock in Northern Germany in consequence of feeding lupins have been considered by certain investigators (Kuhn, Roloff, Arnold and Lemke, Arnold and Schneidemuhl, Damman), as due, not to the alkaloids, but to a hypothetical substance, known as *ictrogen*.

An investigation by Dr. Sellman† showed the presence of alkaloids in American lupins, and pointed to the probability that most, if not all, of the poisoning of live stock in America by lupins, was due to these alkaloids, and not to *ictrogen*. These

* Kellner, O., The Scientific Feeding of Animals, p. 165. Trs. W. Goodwin.

† Lupins as Poisonous Plants, Marsh, C. D., Clawson, A. B., and Marsh, Hadleigh, U.S. Dept. of Agric., Bull. No. 405, Washington, 5th December, 1916.

alkaloids are toxic, or fatal, if a sufficient quantity of the plant is consumed, but they are harmless if the consumption is below a certain limit ; up to this point the lupins may be a useful food if precautions are taken that the limit is not exceeded. The alkaloids can also be largely removed by leaching with water. The author states that the actual cause of death when it occurs from lupin poisoning is paralysis of respiration. In the treatment of lupin poisoning, good results were obtained from potassium permanganate and from tea. All parts of the lupin plant examined were found to be poisonous, the seed being most toxic. The investigation showed that the toxic substance is excreted by the kidneys, and that the intoxication is not cumulative.

Animals may eat comparatively large quantities with no evil results if the toxic limit is not reached at any one time. Poisoning can be avoided by careful handling of the flocks, and by special care being taken to see that hungry sheep are not grazed on fields where there is much lupin.

These latter observations agree with the experience of Suffolk flock-masters. Thus Mr. A. M. Rope, of Leiston, who has had extensive experience of folding lupins, states that he has never lost any sheep through lupin poisoning. He finds, however, that it is important to begin folding lupins gradually, especially if much seed be present in the green pods. If feeding be not begun gradually, the sheep become paralysed. He considers that it is important not to put hungry sheep on lupins, and that the sheep are not so liable to "blow," or become distended with wind, on lupins as on coleworts, or on a clover-ley. Mr. Rope is not in the least afraid of poisoning when folding lupins.

Mr. H. Fulcher, of Hazlewood Hall, considers that it does not matter very much whether the lupins are in the late-flowering stage or in the pod when folded, but his shepherd prefers a few pods. Sheep on his farm have often become paralysed through eating lupins, but they have always recovered. He finds that sheep must not be allowed to feed on lupins for long at a time, but that it is better to give them a short time on the fold at first, and gradually to extend the time. Mr. John Goddard, of Tunstall, finds that sheep become very fond of lupins, and unless care is exercised, they eat too much.

Mr. John Goddard sows a mixture of oats, tares and lupins. An excellent crop of similar mixture, with a few coleworts added, was seen by the writer on Mr. H. Fulcher's farm, on a field recently reclaimed from the heath. When a mixture of this kind is fed, it would appear that practically all danger of lupin poisoning disappears, as the sheep cannot eat enough lupins at once to cause trouble.

Mr. H. P. Skeet finds that a mixture of lupins, oats, and coleworts makes an excellent fold for lambs. He does not consider it desirable to fold pregnant ewes on lupins as the lupins are heating, and trouble at lambing time from sore teats and bad feet is likely to ensue. When fed to sheep in the summer, Mr. Skeet considers that lupins help to expel intestinal worms. As far as the writer is aware, the only farm

animals which are fed with lupins, in Suffolk, are sheep. Rabbits and hares bite them off, but do not eat them to any extent when green. They are very fond of them when in the stack, however, and will visit a stack regularly for the purpose of feeding.

The safest plan when feeding lupins to sheep is to ensure that lupins form only a portion of the diet, allowing the animals a good feed of some other material daily, and that they do not eat too many lupins at once. Sheep cannot live satisfactorily on lupins alone.

Lupin Hay and Silage.—The writer is not aware of any case in which lupins have been made into silage in this country, but they seem very promising material for that purpose. It is, however, hoped to investigate the matter. Kellner gives several analyses of lupin silage and lupin hay. No case has been observed by the writer, however, where hay has been made from lupins in this country: as already stated, lupins are dried with some difficulty.

Removal of Poisonous Properties.—Boodt* has described a method for removing the poisonous substance contained in lupins. A vat is half-filled with lupins and water is then poured in up to the brim, the whole being left to stand for 24 hours. The lupins are then placed in another vat full of fresh water, boiled for 3 hours and left to cool for 12 hours. They are again removed to another vat containing fresh water, where they remain for a further 12 hours, when they are crushed. Boodt admits that this process is not very rapid, but points out that it is necessary to proceed cautiously in order to avoid the slightest trouble on feeding. After crushing, the lupins are mixed with finely-chaffed oat-straw, and the mixture forms an excellent food for cattle.

In Schouwen lupin grain is stated to be fed to horses, with the straw, without any soaking or other treatment.

It occurs to the writer that if some method of soaking and crushing such as that outlined above were found successful in eliminating the poisonous properties of lupins, the resulting product might very well be dried and placed on the market as a cooked crushed food, as is extensively done in the case of cooked flaked maize. The matter is of considerable importance, for lupins, if grown for seed for which a ready market existed, might easily take the place on light land which beans occupy on heavy land. They are easily grown, give excellent crops, with little or no manure, and, on the light land for which they are suited, exercise a marvellous effect upon the succeeding crop.

* *Loc. cit.*

The last characteristic is doubtless due to the large quantity of nitrogen which they accumulate from the air, and to their extensive root system which opens up the soil to less strongly-rooted plants. The question of the commercial utilisation of lupin seed, however, has not yet, as far as the writer is aware, been investigated in this country.

Conclusion.—After a consideration of all the facts observed in the cultivation of lupins the writer has come to the conclusion that their value as a means of improving and reclaiming poor light land is not yet sufficiently appreciated in this country. The effect of a crop of lupins upon the succeeding crop is really astonishing. Lupins grow with surprising luxuriance upon poor, blowing sand, which will grow practically nothing else but rye. The high cost of cultivation is causing farmers to consider carefully what proportion of their land it will pay them to cultivate. It is, therefore, of the greatest importance that any crop which seems to possess properties which make its cultivation on certain soils especially suitable should be carefully studied, and the results obtained from its cultivation made known as widely as possible.

In conclusion, the writer wishes to express his indebtedness to the gentlemen mentioned in this paper, for the very valuable information they have so kindly given him, and also to Mr. Fred Smith, of Woodbridge, who has kindly read through this article. Mr. Smith has had extensive experience with lupins, and has expressed his agreement with the general conclusions arrived at.

THE FOOD OF THE NIGHTJAR

(*Caprimulgus europæus*, Linné).

WALTER E. COLLINGE, D.Sc., F.L.S.,

University of St. Andrews.

THE Nightjar, known more commonly also as the Fern Owl, Churn Owl, Night Hawk, Spinner, Wheel-bird, and by the absurd name of Goatsucker, is a summer visitant to this country. It arrives from its African winter retreat usually about the first or second week in May, and departs, as a rule, about the middle of September, though both earlier appearances and later departures are known.

Like many other crepuscular and nocturnal animals, this bird is regarded with a large amount of suspicion, and many superstitions are associated with it. In some parts of the country it is still believed to be a hawk, and a foe to the poultry yard and to young game birds.

Writing of this bird in 1908, Archibald* states, "it is unfortunate that some unwise person once gave the name of Night Hawk to this species; the designation has been quite enough to cause unintelligent game-preservers, by no means a limited class, to destroy these delightful birds. A glance at their soft bills and feeble feet renders the idea that they take game as ridiculous as the fable that they suck the milk of cows and goats."

In both Warwickshire and Yorkshire the writer has seen specimens nailed up in the "gamekeeper's museum." Moreover, we have a considerable amount of evidence to show that during the past twenty years this bird has seriously diminished in numbers, no longer occurring in localities where it was once common. This is most unfortunate, for there are few birds which are more harmless, or which render better service to the farmer and the fruit grower.

As the Nightjar lays only two eggs, its increase is not rapid, even supposing that in some parts of the country there are two broods.

Practically every writer on ornithology during the last fifty years has endeavoured to dispel the absurd superstitions that have been associated with this very beneficial bird. All are agreed upon the nature of its food, but hitherto we have not possessed any exact and detailed information as to the actual food items or the percentages of such items, and these are now offered in the hope that the Nightjar will be more carefully

* *Jour. Roy. Agric. Soc.*, 1908, Vol. 68, p. 9.

preserved and more strictly protected by the agricultural community.

For the purpose of this investigation the writer has not deemed it necessary or desirable to destroy a large series of specimens in order to obtain a truer estimate of the food. Examples have been obtained from seven widely separated localities, and an average of two specimens per month has been examined for the months of May to September, as shown below :—

Locality.	May.	June.	July.	Aug.	Sept.	Oct.	Totals.
1	1	2	2	2	2	—	9
2	—	2	2	2	2	1	9
3	1	2	2	2	2	—	9
4	1	2	2	2	2	—	9
5	1	2	2	2	2	—	9
6	1	2	2	2	2	—	9
7	—	2	2	2	1	1	8
Totals	5	14	14	14	13	2	62

The whole of the food found in these 62 specimens consisted of animal matter, and this was entirely of an insectivorous nature. So far as the writer has been able to ascertain, by careful and continued observation extending over a number of years, practically the whole of the food is taken whilst the Nightjar is on the wing.

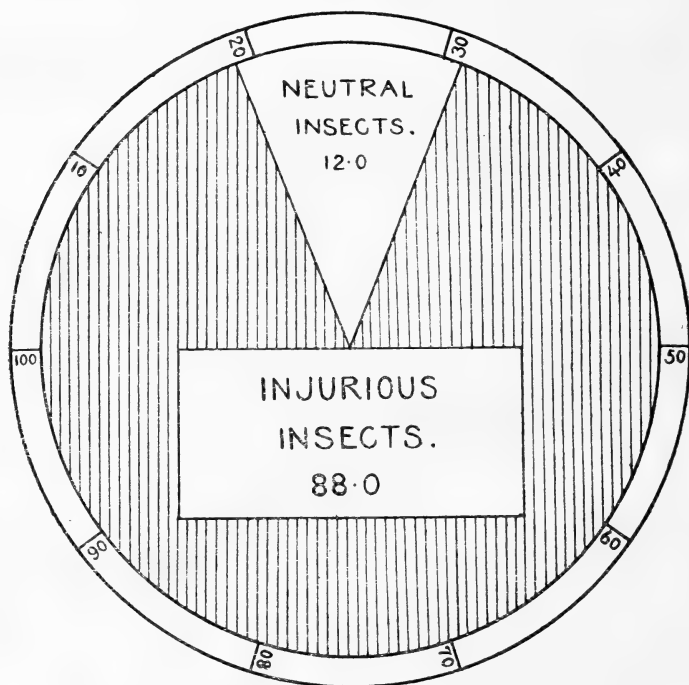
The various items found in the stomachs of the 62 specimens were as follow :—

	Per cent.
Ghost Moth (<i>Hepialus humuli</i> , L.)	13·5
Garden Swift Moth (<i>Hepialus lupulinus</i> , L.) ..	2·5
Winter Moth (<i>Cheimatobia brumata</i> , L.)	1·5
Cabbage Moth (<i>Mamestra brassicæ</i> , L.)	1·5
Turnip Dart Moth (<i>Agrotis segetum</i> , Sch.)	2·5
Heart and Dart Moth (<i>Agrotis exclamationis</i> , L.) ..	5·5
Great Yellow Underwing (<i>Triphæna pronuba</i> , L.) ..	3·5
Remains of Moths (not identifiable)	18·5
Cockchafer (<i>Melolontha vulgaris</i> , Fabr.)	10·5
May Beetle (<i>Phyllopertha horticola</i> , L.)	5·0
June Chafer (<i>Rhizotrogus solstitialis</i> , L.)	4·5
Dung Beetles (<i>Geotrupes</i> sp.)	1·5
Remains of Beetles (not identifiable)	16·5
Crane Fly (<i>Tipula oleracea</i> , L.)	5·5
Remains of other Dipterous Flies	7·5
	100·0

A summary of these figures shows that of the total bulk of food consumed from May to September 88 per cent. consists

of insects harmful to agriculture, while 12 per cent. consists of insects of a neutral character (see Figure).

Little need be said as to the harmful insects. All are common and widely distributed species, and amongst the most injurious pests with which the farmer and fruit-grower have to contend. Some, *e.g.*, the Cockchafer, May Beetle, and June Chafer, are exceedingly difficult to deal with, especially when attacking a large acreage of crops, and were it not for the good offices of the Nightjar and a few other wild birds there is little doubt but that the losses occasioned by these insects would be of a very serious nature.



Diagrammatic Representation of the Percentages of Food of the Nightjar.

The actual number of insects destroyed is very difficult to estimate, but it may be of interest to cite the stomach contents in a few cases. In one bird, shot in the early morning in July, remains of 15 June Chafers, 67 Garden Swift Moths, 40 Turnip Dart Moths, and 8 Great Yellow Underwing Moths were present in the stomach. In a specimen shot in August, about 10 p.m., the stomach contained remains of 163 Crane Flies, in addition to fragments of numerous moths and beetles.

From long observation of the Nightjar and its habits we believe that it is very uncommon for this bird to feed during the day-time, although a few instances of day-time feeding are on record ; nevertheless, the amount of food it takes from sunset to sunrise must be considerable. Digestion, we know, is fairly rapid, but in all the 62 birds examined there was only one of which the stomach was about three-quarters full ; in the remaining 61 obtained between the hours of 10 p.m. and 4 a.m. the stomach was tightly packed with food only recently taken and the remains of food previously obtained.

In view of the very beneficial nature of this bird's work, farmers would do well for the general good and their own interest to use their utmost efforts to protect and preserve it.

As far as any future legislation is concerned, the Nightjar, and its eggs, should be protected during the whole of its residence in this country.

THE WARBLE FLY.

EVERY farmer is familiar with the barrel-shaped maggots that are often to be found in large numbers from January until May just under the skin on the backs of cattle. These maggots are the grubs of the warble fly. When present in large numbers they are the cause of enormous loss to farmers, much greater than is commonly realised. At a low estimate the annual loss in damaged hides alone is put at upwards of £500,000. This, however, is not the only damage they do. The butcher often finds the flesh beneath the "warbled" areas so altered by the inflammation set up that the beef is what is known as "licked" and is useless for human food.

Although the maggots are the chief culprits, the adult flies are by no means free from blame. When flying round on the lookout for a suitable place to lay their eggs they frighten the cattle, which rush about the field with their tails in the air. This "gadding" often causes the animals to lose condition and decreases the yield of milk in cows.

Kinds of Warble Flies.—There are two kinds of warble flies in this country ; both are much like small bumble bees in appearance and fly in bright sunshine with a "hum" distinct but not loud. The larger warble fly, known scientifically as *Hypoderma bovis*, and generally more common, has whitish hairs over the front of the body and lemon yellow hairs at the tail, while the smaller kind, *H. lineata*, has the front region largely bare of hairs and a bright orange tuft at the tail.

Description and Life of the Pest.—The egg-laying season lasts from May until September, the smaller fly appearing first, and the larger one or two months later. As may be seen from Fig. 1, the eggs are of a rather curious shape. They are about one-twelfth of an inch long and each one has a grooved base by which it is attached to the hair of the animal. The eggs are laid by the female chiefly on the hind legs of the animal attacked and usually just below the heel joint or hock, more rarely on the flanks, and apparently never on the back. The larger fly, *H. bovis*, lays her eggs singly near the base of a hair, but the smaller one, *H. lineata*, places them in a row of seven or more half-way up a hair.

In four or five days the little maggots are hatched and at once enter the skin close to where the eggs were laid. At this stage the maggot is only one-thirtieth of an inch long, but it has relatively very strong sharp jaws and spines. Having bored into the skin the tiny maggots spend some time wandering through the system of the animal until they finally reach the wall of the gullet in which they are found embedded from September to January. They are now in the second stage, somewhat narrow and cylindrical, with feeble jaws and very few spines. After several months' residence in the gullet wall the maggots continue their wanderings and begin to appear under the skin on the back of the animal, sometimes as early as November and December, but much more frequently from January onwards. Here they enter upon the third stage of their existence; they become larger, thicker, and more spiny (Fig. 2). Each maggot lies in a small swelling, feeds on the fluid which arises from the animal's inflamed flesh, and breathes through a hole that is bored through the skin, the air openings at the maggot's tail end being immediately under this hole.

In late winter or early spring most of the maggots become fully grown and afterwards work their way out through the holes in the skin and fall to the ground. They have a large number of tiny sharp spines arranged in rows on their bodies, and these spines help their movements. Falling to the ground the maggot undergoes a change, its outer coat becomes hard, firm, and dark in colour (Fig. 3); for six weeks or so it remains motionless among the grass, or under a stone or clod, the insect being now in its resting or pupal stage. Then a round lid splits off from the front end and the fly comes out.

How to Destroy the Pest.—There is no evidence that the various washes and smears commonly recommended for use in summer are of any value in preventing flies from laying their



WARBLE FLIES.

1. *Hypoderma bovis*, Male. 2. *Hypoderma bovis*, Female.
 3. *Hypoderma lineata*, Female.



Piece of tanned leather showing warble fly damage



FIG. 1.—Eggs of
H. Lineata.



FIG. 2.—Full fed Larvæ of Warble Flies.



FIG. 3.—Puparia of Warble Flies.



FIG. 4.—Underside of a piece of skin showing
Warble Fly larvæ.

eggs on the cattle. Some protection may, however, be afforded by giving the cattle access to shade and water in which they can stand, and it is worth remembering that yearling and two-year-old bullocks and heifers are more subject to warble fly attack than young calves, and calves more than milch cows.

The most effectual method of exterminating the insects at present known is to squeeze out and destroy the ripe maggots, beginning early in May and continuing during June, July and August. Where several maggots are removed from a small area of skin, it is advisable to apply carbolic oil. Several types of "dip" and "smear" are of some value in killing warble maggots, but none is yet known to be so certainly deadly in its effect on the maggots, and at the same time harmless to the cattle, as to warrant its general recommendation as an alternative to the more troublesome but effective squeezing out operation, and it is the latter which is recommended for the present.

An appeal is made to cattle owners in their own interests to kill as many warble maggots as they possibly can, and not only to destroy the pest themselves, but to persuade neighbouring farmers to do the same, for unless the practice is general over wide areas the results will be disappointing.

Farmers do not seem to realise that they are themselves bearing a high proportion of the immense loss occasioned by warbles, as they are every year getting lower prices for their cattle than they would command if warbles were exterminated or even greatly reduced in number. Warbles are certainly troublesome pests to deal with, but if all farmers would, for any two or three years, take the necessary steps, there is no reason why the insects should not be almost exterminated. The higher prices which would then be obtained per beast would compensate many times over for the trouble taken in eradicating the pest.

(This Article is also issued as a Leaflet, known as A. 312/1. Copies may be obtained free of charge and post free on application to the Secretary, Ministry of Agriculture and Fisheries, 3, St. James's Square, London, S.W. 1. Letters of application so addressed need not be stamped.)

" STRIPE " DISEASE OF TOMATOES.*

S. G. PAINE,

*Lecturer in the Department of Plant Physiology and Pathology,
Imperial College, London,*

AND

W. F. BEWLEY,

Mycologist, Experimental and Research Station, Cheshunt, Herts.

THE disease known as " Stripe " is of common occurrence in nurseries in this country, and at times it causes the grower considerable losses. During the early part of 1919 about 25 per cent. of the crop obtained from the experimental houses at the Cheshunt Station was so badly affected that it could be sold only as " seconds." " Stripe " disease has been known to cause complete loss of the crop in badly-infected houses. In 1910 some examples of plants attacked by this disease were received at Kew from two localities where it was stated to be present in epidemic form. Though stripe is mainly a disease of the forcing house, it has been observed in a garden where plants were grown in a position facing south and sheltered by a high wall. A similar disease, which is believed to be identical with stripe, has been reported from the United States and Canada, and was once found in the neighbourhood of Toronto on field tomatoes, of which about 1 per cent. were affected.

Description.—The symptoms of the disease are well marked; the main features are brown stripes on the stems, brown, sunken patches on the fruit, and brown, shrivelled areas on the leaves. The stem stripes or " blazes " may occur at intervals along the stem or, in bad cases, may be so numerous that no region of the stem is free from them; they vary from small, brown spots to long, sunken furrows, which often extend from the base of one leaf to the node below. The fruit " spots " are irregular sunken blotches of a light or dark brown colour scattered promiscuously over the surface of the fruit. The affected leaves at first show light yellow patches between the veins, which turn brown later and spread so that large areas are reduced to a dry, shrivelled condition, causing considerable distortion of the leaves.

The disease frequently occurs in the seed-bed, producing rapid destruction of the plants, and necessitating fresh sowings. Most commonly the disease does not show itself until the tops

* This account of the disease is an abbreviation of an article shortly to appear in the *Annals of Applied Biology*, Vol. VI., in which the disease and its causal organism are to be fully described.

are allowed to develop, although it is not unusual to find the disease in the spring when the first pickings are being made.

The plants are generally attacked underground, the causal organism being introduced into the cortex of the root or stem through wounds caused by biting insects. The aerial parts of the plants are likewise subject to infection through insect bites, and also by the organism being carried on to them by the pruning knife.

The organism travels through the stem in the parts of the pith adjacent to the vascular bundles, and is rarely to be found in the wood elements themselves. From the pith the disease passes by way of the medullary rays to the cortex, forming lesions in the outer cells and causing the sunken furrows to be formed at the surface. The attacked tissue becomes stained a dark brown colour and, on cutting the stem or petiole, the diseased patches can at once be recognised by the naked eye. The organism enters the fruit through the stalk and finds its way to the outside by channels which, when the fruit is cut open, can often be seen as narrow-brown streaks in the neighbourhood of the vascular bundles; in the same way the seed may become infected or, if not actually infected, since it has often been found in the loculus, the organism may be dried upon the seed coat so that on germination the young seedling may become infected.

The causal organism is a small, yellow bacillus closely related to, if not identical with, *Bacillus lathyri* (Manns and Taubenhauß), which causes a very similar disease in the sweet pea.

Varieties of tomatoes differ markedly in their susceptibility to the attack of this organism; "Kondine Red" and "Comet" were found to be much more affected than "Ailsa Craig" when grown on the same soil and under the same conditions. Generally, those varieties which show rapid, soft growth in the early stages are the most susceptible.

Manurial treatment has considerable influence upon the susceptibility of the plants. As has been frequently shown in connection with other diseases, excessive nitrogen and a lack of potash in the fertiliser tend to lower the resistance of the plant to the invasion of the parasite. The effect of too much nitrogen can be largely counteracted by an increase in the amount of potash.

Preventive and Remedial Measures.—1. Bacteria have been isolated from the loculi of tomatoes which before cutting showed very little sign of disease; hence, owing to the difficulty experienced in thoroughly removing the glairy coating from

the seed, it is highly probable that bacteria would become held in this substance as it dried round the seed, and on being released during germination would endanger the crop. Seed obtained from fruit grown in an infected area should not, therefore, be used.

2. The selection of a resistant variety should be aimed at.
3. Sterilisation of the soil by heat should be practised where an attack has occurred.
4. Excessive nitrogen and a deficiency of potash in the fertiliser should be avoided.
5. Special care in pruning should be exercised where the presence of the disease has been observed. While pruning an affected plant, and especially before passing from such a plant to its healthy neighbours, the pruning knife should be sterilised by wiping the blade with a cloth soaked in 2 per cent. lysol or some similar disinfectant. The prunings from an affected plant should be carefully collected and burnt.
6. In cases where infection has occurred on the upper part of a plant, removal of the attacked stem and the development of a lateral shoot will often lead to complete recovery and to a clean crop of fruit.
7. When plants in the early stages of growth are badly infected, further extension of the disease can be checked by so altering the conditions of heat and damping as to favour more hardy development. Under such treatment plants have been known to "grow out of" the disease, and to yield a crop of sound fruit.

THE following Note has been communicated to the Ministry by Mr. Alfred Wood, Secretary of the British Sugar Beet Growers' Society, Ltd. :—

**Home-Grown
Sugar.***

The work which the British Sugar Beet Growers' Society has been conducting at Kelham, near Newark, is now approaching a critical stage in its history. A Company is about to be formed for the purpose of carrying out at that place an experiment in sugar production on commercial lines. The public are now to be asked to take a part in this great work, since, owing to the recent severe reduction in their sugar allowance, they are thinking and talking a great deal about the position of the country with regard to

* See articles on cultivation of Sugar Beet in this *Journal* for January, 1911, p. 793, February, 1915, pp. 969 and 988, June, 1915, p. 210, November, 1915, p. 750, and March, 1916, p. 1210.

this important commodity. The capital of the Company is to be nominally £1,000,000 sterling, but only half of this is to be issued, and of this half the sum of £250,000 is to be taken up by the Government and £250,000 by the general public. For 10 years the £250,000 to be taken up by the Government will not rank for dividend until a 5 per cent. dividend upon the public capital has been provided for, and in no circumstances can the interest on the Government shares exceed 5 per cent. The dividend upon the public capital will be guaranteed by the Government for 10 years at 5 per cent.

It will be seen, therefore, that the Government are taking a very practical share in the work of establishing a sugar industry in England. The Company about to be formed will be exclusively British in capital and control. An important point is the fiscal advantage which home-grown sugar enjoys over foreign imported sugar under the Finance Act of 1919. This advantage is very considerable. The home-grown article has a preference of more than £6 4s. per ton over the imported foreign article, and of nearly £1 19s. per ton over the very small amount of sugar which we receive from our Dominions and Dependencies. The price of sugar, even allowing for a heavy fall in the market, seems likely to remain high enough to justify a good price to the farmer for his roots, a satisfactory wage to the worker in field and factory, and a remunerative interest on the invested capital. The conditions are, therefore, all favourable, and the "infant industry" at Kelham will see the light in circumstances which ought to ensure to it a vigorous childhood and a long and prosperous life.

It is, perhaps, not generally known that England is nearly the largest consumer of sugar in the world. Even on the prices ruling before the War we consumed in the United Kingdom £25,000,000 worth of sugar every year. This is an immense market, and it is a pity that England should so long have dispensed with the social, economic and industrial benefits of this great and always increasing demand.

The first business of the new Company, when the capital has been contributed, will be to erect a factory at Newark on the estate at Kelham, not far from the Board's Land Settlement Colony. This factory will be placed on a site exceptionally favoured with transport facilities by river, road and rail.

Another important task before the Company will be to secure a sufficient acreage under sugar beet in the neighbourhood

of Newark to supply the factory with the sugar beets necessary for its full operation.

In conjunction with the Board of Agriculture, the Society has been preparing its estate at Kelham with a view to the cultivation of beet. The estate will serve as a central demonstration farm for local farmers. Even a single factory should bring manifold advantages to the neighbourhood in which it is placed, providing employment in summer in the fields and in winter in extracting and refining sugar, while it should create subsidiary industries and stimulate those already existing. The factory cannot be ready and the beets available during the present year. The opening campaign falls in the year 1921, by which time all the preparations should be complete.

It is hoped that the Kelham enterprise will prepare the way for many similar undertakings throughout the country, by providing an interesting and instructive object lesson in the methods of running a great sugar business. The promoters of the Kelham scheme include many agriculturists of established national reputation, the Chairman of the Committee of Management of the British Sugar Beet Growers' Society being Sir Beville Stanier, Bt., M.P. The Committee includes such members as Lord Selborne, Lord Bledisloe and the Hon. Edward G. Strutt.

It is perhaps necessary to explain for the benefit of those who do not live in a district where the system is practised that the word "stetch" is the term for a narrow strip of ploughed land separated by an open or dead furrow from the strip on either side. In the stetch the furrows all turn to the centre, half the furrows being from the right and half from the left. It will be clear that by continuing this process the open or dead furrows separating the stetches will be approximately double the width of an ordinary furrow. This method of ploughing is commonly practised on heavy land in the Eastern Counties for the purpose of carrying off surface water from such crops as winter wheat, oats and beans. In many cases stetches are made the same width as the corn drill and cultivator so that the horses can walk in the open furrow and obviate any treading or puddling of the seed bed.

Stetches vary in width in different parts of the country, but in Essex the standard width is 6 ft., excluding the open furrow, which is about 18 in. wide. Ploughing such narrow strips by

steam tackle—using a balance plough and doing half a stetch at a time—or by horses is a laborious operation, and a new plough has been specially designed to plough by means of steam tackle stetches of a width of about 7 ft. 6 in. in one operation.

It may be stated that Mr. Edward Robinson, of Southminster, Essex, was the originator of this plough. He first of all constructed a working model on a cultivator frame, and this experimental implement did a good deal of useful work. The new type of plough was brought to the notice of the Food Production Department, and the idea appeared to be so promising that it was decided to make arrangements with Messrs. John Fowler & Co., Leeds, for an experimental plough to be built on the lines suggested by Mr. Robinson, the cost being borne by the Department. Some improvements were introduced at the suggestion of the Department and of Messrs. Fowler & Co., and eventually an experimental plough was constructed. The implement was first tried under actual working conditions in Essex in October last, and proved highly satisfactory. Mr. Robinson at once agreed to purchase the plough and ordered another one of the same type from the makers. At the trial, land was ploughed at the rate of about $2\frac{1}{2}$ acres per hour, and as the implement recently ploughed 70 acres in five short working days it appears to be maintaining an excellent record under working conditions.

Description of the Plough. — The plough is constructed to cut eight 9-in. furrows, and is capable of ploughing to a depth of 6 in.; it is supplied with skives, mould-boards, steel top and bottom frames, turning-lever, lifting-gear, and self-acting raising-gear.

The construction and work of the plough are shown by the three photographs reproduced.

The plough is of the class used for cable traction, and is turned round for the return bout by the pull of the engine cables, which are attached to the triangular turning-lever carried by the implement; each cable becomes alternately the hauling rope and the slack rope.

The turning and lifting are done by the pull of the cables, through a lever, a lifting chain and segment on the axle. The top frame is carried on a main axle, two hind wheels, and a front or steering wheel. The plough is fitted with steerage gear and self-lifting gear, as well as automatic cushion apparatus for damping the fall of the underframe.

The underframe consists of two complete and independent frames, one carrying right-hand and the other left-hand plough

bodies, which are separately adjustable vertically: and each complete frame with its plough bodies is also vertically adjustable independently of the other by means of a wheel at the front end, and two adjusting screws and blocks at the hind end. The plough bodies are carried on standards, and comprise shares, sled and mould-board, which may be of various types to suit the particular land on which the plough is expected to work.

In conjunction with the adjusting screws and blocks at the hind end, vertical guides are provided to prevent lateral movement of either underframe. The front end of each underframe is provided with lateral adjustment for draft. The underframes are raised and lowered by means of a four-chain lifting-gear so arranged that each underframe is lifted at three points.

The accurate turning of the plough at the headlands is ensured by automatic pawl catch gear, consisting of a circular rack, fitted to each of the hind wheels, automatically preventing the wheel on which the implement pivots when turning from revolving in a backward direction. The pawl catch is arranged in combination with the lifting-gear, so that when the underframes are in work the catch is held out of action, but when the underframes are raised out of work, the catch automatically engages itself with the toothed circular rack and prevents backward movement of the pivot wheel.

The plough as described above is suitable for working on land where drainage furrows already exist, and will leave new drainage furrows midway between the old ones, at a distance apart equal to the width of the land ploughed at each bout, as shown in the accompanying sketch.

For land where drainage furrows do not exist, a central plough body, with double mould-board, will be provided, suspended between the twin underframes, the object being to open out a central furrow so that the plough can work as above described and plough the fields in "lands" similarly to the method adopted with ordinary horse ploughs.

The right hand underframe which is a little in front of the other turns the first furrow into one half of the open furrow, where one exists—which is always the case when the land has been ploughed in "stetches"—and the first plough on the left-hand frame turns a furrow into the other half of the open furrow. If no open furrow exists, the central plough opens up one. The last plough on each frame leaves half an open furrow on each side of the land ploughed, and when the implement is turned round at the headland and commences

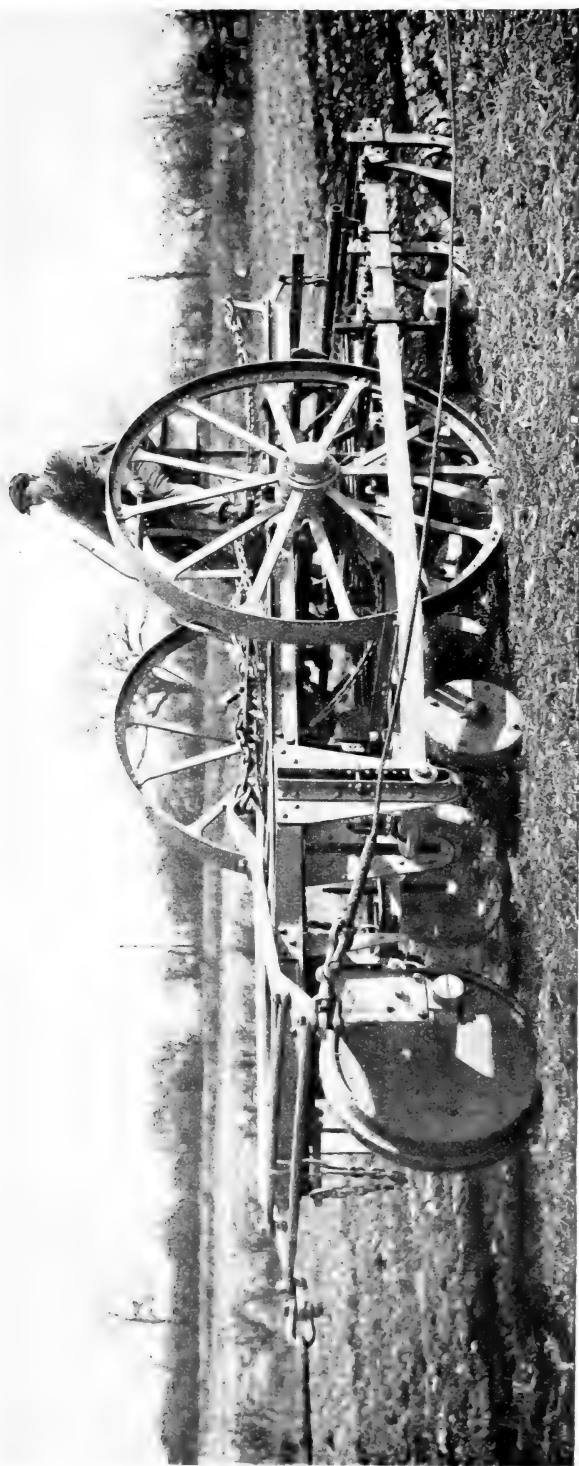


FIG. 1.—Front view of Plough.



FIG. 2.—Side view of Plough.



FIG. 3.—Showing Plough in operation.

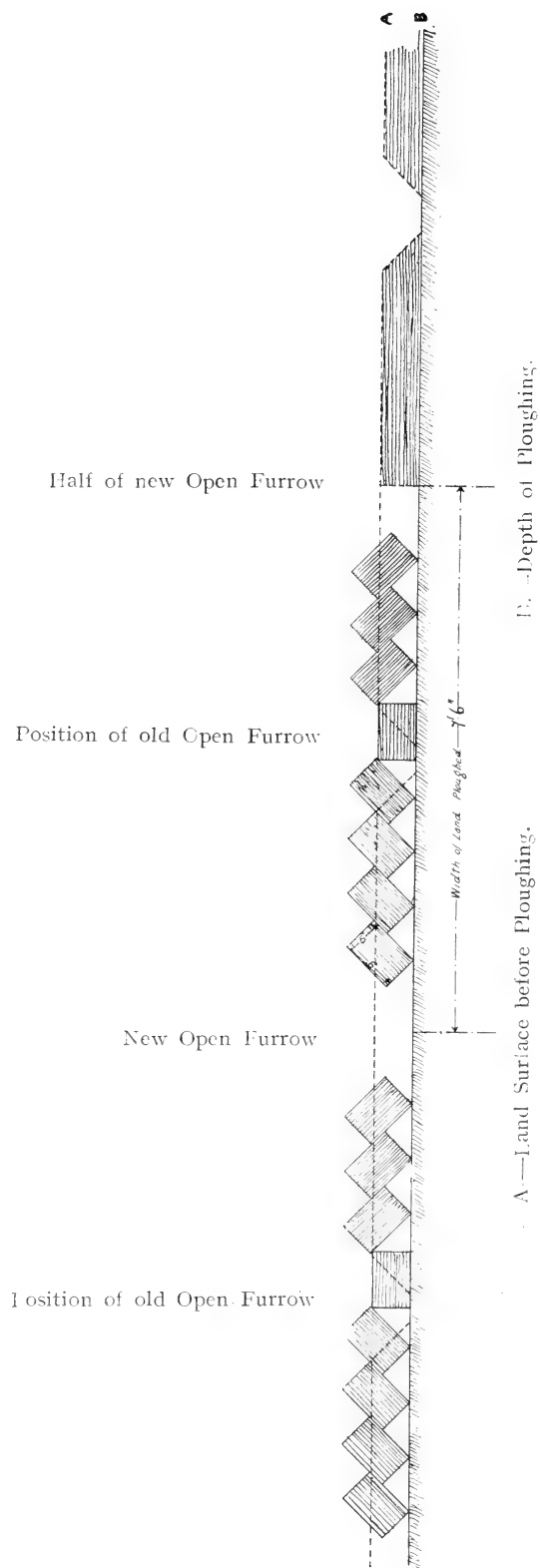


FIG. 4.—Diagram showing Method of tetch ploughing.

the next bout, the last plough on the frame on the inside of the turn completes the open furrow by turning a furrow away from the land already ploughed.

It may be mentioned, in conclusion, that this plough can only be used for ploughing stetches of one standard width, and that if wider stetches are required to be ploughed by this process, a new model of the plough would have to be built for the purpose.

THE Report of this Committee, just issued (Cmd. 483), is the fourth and final Report submitted. The first and second

**Report of the
Committee on the
Production and
Distribution of Milk.**

Interim Reports (issued in June and November, 1917*) dealt almost entirely with questions of immediate urgency, and were chiefly devoted to the problems of keeping up the milk supply and for providing for equitable distribution in the winter of 1917. In the third Interim Report (November, 1918†) attention was given to problems which, though not mainly arising through war conditions, had nevertheless been disclosed and emphasised during the War. The present Report deals chiefly with matters affecting the milk industry and its development in the future.

I.—Present State of the Milk Supply.—(a) *Production.*—The Committee submit figures which show that although there has been a slight increase in the number of cows and heifers in milk since 1912, yet the statistics available for the United Kingdom suggest that the production of milk, after rising from 1,895,000,000 gal. (1909-13 average) to 1,910,000,000 gal. in 1914, has since steadily decreased to 1,505,000,000 gal. in 1918.

This decreased production is ascribed to—

- (a) Scarcity of the proper feeding stuffs.
- (b) Deterioration in the quality of cakes and meals.
- (c) Lessened efficiency of milkers.

(b) *Consumption.*—The Committee record their opinion that the average consumption of milk in the United Kingdom is much lower than is desirable in the national interest. They emphasise the importance of the growth-promoting substances (vitamines) which exist in common to milk and butter, and the great value of these vitamins, especially to young children. The present daily average consumption per person for Great Britain is estimated at 0.25 pt. of liquid milk, varying from 0.10 pt. in Inverness-shire to 0.31 pt. in London. This average consumption

* See this *Journal*, January, 1918, p. 1133, and July, 1918, p. 452.

† " " " 1919, pp. 1206-1214.

is less than half the normal average consumption of the City of New York. In many industrial centres there are known to be whole streets where no fresh milk is taken. The increase in the production of milk has not kept pace with the increase in the population, the increases since 1891 being, respectively, 40 per cent. and 60 per cent., and this has led to a vast increase in imported dairy produce, especially condensed and dried milk. Dairy farming methods have not kept pace with the developments brought about on the Continent. This is ascribed to (a) the agricultural depression of the 'nineties of last century; (b) the slow development of co-operation amongst farmers; (c) the defective system of agricultural and dairying education; and (d) the almost total neglect of research in dairying subjects.

The Committee, while fully realising the essential difference in national temperament between the population of the United Kingdom and the population of continental countries, are convinced that the dairying industry would be greatly benefited by the adoption, with necessary modifications, of methods which have given excellent results in other countries, and recommendations are made accordingly.

II.—Relation between Price and Consumption.—During the War the increased cost of milk has tended to decrease consumption. When the price of feeding stuffs rose the normal difference between winter and summer costs of production was accentuated. In order to safeguard the supply of winter milk a much greater increase in price was necessary for that period than for the summer, and this variation in price has resulted in a greater variation in consumption than was formerly the case. An unduly high price for milk is prejudicial to the future of the dairying industry, for it not only reduces consumption but makes it well-nigh impossible to compete with the foreigner in the manufacture of dairy products.

The Committee believe that it would be in the ultimate interest of the consumer and would assist in an adequate supply of winter milk if it became a recognised practice to charge a higher price during the winter months, although this would probably lead to a variation in consumption.

In this connection the following table of the monthly variation in percentages of the total annual production, according to the daily average during the years 1917-18, is of interest:—

Jan.	Feb.	March.	April.	May.	June.	July.	Aug.
5·9	6·0	6·9	8·1	10·8	11·8	10·3	9·8
Sept.	Oct.	Nov.	Dec.				
9·1	8·3	7·1	5·9 = 100.				

III.—Necessity for Lowering the Cost of the Production of Milk.—

The Committee submit surprising figures showing the variation in the cost of production. Returns from 43 farms show a variation in net costs for the winter 1916-17 of 10*d.* per gal. On six farms the cost was less than 10*d.* per gal. ; on six farms 20*d.* per gal. It is pointed out that during the period of controlled prices the economical production of milk is not effectively stimulated for the reason that cheaper production will tend to lower maximum prices.

IV.—Present State of Milk Supply—Quality and Cleanliness.—

Not only is the amount of milk consumed in Great Britain much lower than desirable, but the quality as regards cleanliness is grievously defective. In the United States of America no raw milk with more than 30,000 bacteria per c.c. may be sold for human consumption. In 1916-17 Professor Délépine, investigating samples of milk delivered to Manchester hospitals, found that out of 30 samples 64 per cent. contained over 1,000,000 bacteria per c.c. The special Sub-Committee on the handling of milk makes many recommendations for effecting a much needed improvement, tracing the milk from the moment it is drawn from the udder of the cow until it reaches the consumer. The point that great improvement is possible without large expenditure on buildings and equipment is emphasised. The present system, or lack of system, in handling milk on railways is condemned, and suggestions are made as to how improvements may be effected.

V.—Policy of the Future.—Reference has been made in preceding paragraphs to some unsatisfactory conditions of the milk industry and to the necessity of increasing consumption and production. The Committee are aware that this cannot be accomplished hurriedly without the sympathy and co-operation of both producer and consumer. The aims of an enlightened milk policy should be :—

- (a) To bring about the utmost economy in production.
- (b) To improve the hygienic quality of milk.
- (c) To increase the supply to meet increased consumption which should follow improved quality.
- (d) To prevent the exploitation of the producer or consumer by any trust or combination.

VI.—Steps to be taken to Reduce the Cost of Production.—The Committee consider that the cost of production can be lessened :—

- (1) By reorganising the system of herd management in order to (a) reduce the loss when high-priced cows are sold for slaughter ;

(b) lengthen the milking period ; (c) obtain better distribution of the dates of calving ; and (d) reduce as far as possible dependence on purchased foods.

(2) By improving the average yield per cow.

(3) By more economical and methodical feeding.

(4) By the introduction of labour-aiding machinery and gradual rearrangement of farm buildings.

(5) By more business-like methods of book-keeping.

(6) By greater cleanliness in production and handling of milk, thus reducing losses due to souring.

(7) By the extension of co-operative methods in the purchase of feeding stuffs and manures, particularly on the part of small farmers.

(8) By the State-provision of veterinary help so as to reduce losses due to contagious abortion, tuberculosis, etc.

(9) By better organisation of collection and transport of milk.

These points are dealt with in detail, and instances are quoted of the saving effected on specific farms, thus :—

On farm A the average number of cows in milk was 53, the total cost of food was £794 15s., and the total yield 46,221 gal. of milk.

On farm B the average number of cows in milk was 51, the total cost of food was £774 17s. 3d., and the total yield 36,033 gal.

The cost of food per gal. on farm A works out at 5·12d., on farm B 7·4d.

The Committee estimate that if the average yield per cow in the United Kingdom could be increased by one-tenth of a gal. per day, present prices would automatically fall about 2d. per gal.

Higher yields may also be obtained in the summer months by judicious manuring of pastures.

The question of tuberculosis is fully dealt with, and specific recommendations as to the future use of the tuberculin test are made.

VII.—Improvement in Hygienic Quality.—The Committee consider that the principle of grading milk is sound, as it offers to farmers generally an inducement to improve the quality of their milk, and tends in a short time to eliminate milk of a high^r bacterial content.

When the grading of milk was first commenced in New York, in January, 1912, 40 per cent. of the city's supplies fell within the definition of the lowest grade, Grade C. In July, 1914, the amount of Grade C milk sold in the city was negligible, one-seventh being Grade A, and six-sevenths Grade B. The steps taken to raise from Grade C to Grade B were within the

capacity of all producers and dealers. By attention to those details which have proved to be of the greatest importance it has been clearly demonstrated that it is possible to produce milk with a very low bacterial content without the aid of model buildings and expensive equipment.

VIII.—**Increased Production of Milk in Great Britain.**—The vital question of labour has been investigated by a special Sub-Committee, and much useful information is included in the Report attached to that of the main Committee. This Report includes details of a number of systems of co-partnership which are operating successfully in various parts of the country. The Committee make the following recommendations :—

(1) The number of dairy stock in the country should be increased as much as possible.

(2) Arable dairy farming should be encouraged and extended. In this connection they welcome the establishment of the Arable Dairy Farming Demonstration Farms by the Board of Agriculture.

(3) Facilities should be given for the importation of Holstein cattle, and the question of the importation of other dairy breeds should be inquired into.

(4) A careful examination should be made of the relative economy of the different home breeds under varying influences of soil and climate.

Several appendices are attached to the Report.

THE following estimate, prepared by Mr. Wilfred Buckley, Director of Milk Supplies, Ministry of Food, of the cost of production of one gal. of milk on the average farm in Great Britain during the period 1st December, 1919—30th April, 1920, omitting (a) interest on capital, (b) managerial expenses, (c) profit, is extracted from the issue of the *National Food Journal* for 10th December, 1919.

**Cost of Milk
Production.**

The figures shown in the tables are calculated on the following premises :—

(i.) *Labour.*—One man can milk and attend to twelve cows in milk and the proportion of dry cows that are in the herd. To carry out this work, seventy hours weekly are required. (In case one man does not work this number of hours the services of another person are required to complete the work.)

Minimum wage (Derbyshire, etc.), 37s. 6d. for 48 hours plus 1s. 0½d. for 22 hours' overtime equals 60s. 5d. or 8·63 pence per day per cow.

NOTE.—The minimum wage is higher in many counties than the above. A large proportion of cowmen are paid in excess of the minimum wage.

(ii.) *Daily Maintenance Ration* per cow whether dry or in milk :—12 lb. hay at 140s. per ton, 9·00 pence ; 8 lb. straw at 50s. per ton, 2·16 pence ; 56 lb. roots at 27s. per ton, 8·10 pence. Total, 19·26 pence.

These foods, being in the majority of cases home-grown, are calculated at the cost of production and not at market values.

(iii.) *Production Ration for Cows in Milk*.—3 lb. of cake (or its equivalent in some other form of concentrated food) for each gallon of milk at a cost of £25 per ton, less manurial value at 66s. 6d. per ton, *i.e.*, £21 13s. 6d. per ton net, equals 6·97 pence per gal.

(iv.) *Depreciation* per cow at the rate of £5 per annum equals 3·33 pence daily.

(v.) Costs of (a) proportion of rent and rates, (b) repairs, (c) depreciation on machinery, (d) delivery, are off-set by the value of calves born.

On the above data, the cost of production in respect of cows in milk varies in proportion to the yield per cow, as under :—

TABLE A.

YIELD OF MILK PER COW PER DAY.

Items.	2 gal.	1½ gal.	1½ gal.	1½ gal.	1 gal.
Labour	8·63	8·63	8·63	8·63	8·63
Maintenance ration ..	19·26	19·26	19·26	19·26	19·26
Production ration ..	13·94	12·20	10·45	8·71	6·97
Depreciation ..	3·33	3·33	3·33	3·33	3·33
Cost per cow daily ..	45·16	43·42	41·67	39·93	38·19
Cost per gal. of milk in pence	22·58	24·81	27·78	31·94	38·19

In addition to the cost of maintaining those cows that are in milk, there is the added cost of those cows that are dry. The following figures show the costs in pence that have to be added for the maintenance ration of dry cows, in proportion to the various yields per cow in milk :—

TABLE B.

Basis of Yield per Cow in Milk.	2 gal.	1½ gal.	1½ gal.	1½ gal.	1 gal.
In case there is one dry cow to two in milk	4·82	5·50	6·42	7·70	9·63
In case there is one dry cow to three in milk	3·21	3·69	4·28	5·14	6·42

In Mr. Buckley's opinion the average cow in milk from 1st December to 30th April will yield, approximately, $1\frac{1}{2}$ gal., and there will be in the average herd one cow dry to two cows in milk. He therefore estimates the average cost per gal. to be for each cow in milk 27.78 pence per gal., for proportion of dry cow 6.42 pence per gal. : total cost per gal. 34.20 pence.

Is it too late to use Lime now?—A correspondent writes to ask whether it is too late to use lime in the following circumstances:

He has applied 16 tons of farmyard manure and intends to sow white spring oats; **Notes on Manures for February:** can he top-dress with lime now, and, if so, *From the Rothamsted Experimental Station.* how close to drilling time will this be permissible?

The reply is that lime is hardly necessary for spring oats, as this crop needs it much less than certain other crops. The most effective place in the rotation to apply lime is just before clover. It can also be used with considerable advantage on barley and on swedes, but other arable crops do not require it to so marked an extent.

The simplest case arises where the clover is sown in the barley; lime can then be applied some time before drilling the barley so that both barley and clover may benefit.

The correspondent further inquires whether lime can with advantage be given to mangolds. This crop does not respond to lime so well as swedes, but if there is any difficulty in securing a tilth lime would be distinctly useful. Otherwise lime is better reserved for the swedes and turnips.

The worst place for putting on lime in the rotation is just before the potato crop, and this should never be done where there is any fear of Scab.

Sulphate of Ammonia and Nitrate of Soda.—In reference to the statement in the December notes (this *Journal*, November, 1919) that the price of nitrate of soda compares favourably with that at which sulphate of ammonia can be obtained, a correspondent asks whether this implies that nitrate of soda is a better fertiliser than sulphate of ammonia? No such implication is meant; the two fertilisers are quite distinct, and although they are often interchangeable it is by no means always possible to use one instead of the other. Nitrate of soda is quicker acting than ammonium sulphate and, therefore, in many cases more useful. Further, it does not exhaust lime like sulphate of ammonia and can, therefore, be used on light soils deficient in this substance. On the other hand, ammonium sulphate is

considered distinctly superior for certain valuable crops such as potatoes, malting barley, etc., and it has no adverse effect on the tilth of heavy soils where nitrate of soda may be harmful. On the basis of chemical composition, 76 lb. sulphate of ammonia contains as much nitrogen as 100 lb. nitrate of soda, but the nitrogen in sulphate of ammonia is not so effective lb. for lb. as that in nitrate of soda; in fact, 1 lb. nitrogen in nitrate of soda is as effective as 1.035 lb. nitrogen in sulphate of ammonia; and on an average of all crops 100 lb. of ordinary nitrate of soda are about as effective as 80.3 lb. of sulphate of ammonia. These figures, however, take no account of the special uses of the two substances to which reference has just been made.

Price of Mixed Fertilisers.—A correspondent, interested in the fertiliser trade, has suggested that the comparison made in the December notes between the home-made and the purchased mixed fertilisers is unfair, for the following reasons:—

1. That the receipt given for the home-made fertiliser would not as a matter of fact contain the same constituents as the proprietary article in question; he offers two receipts which would cost, respectively, £14 4s. 3d. and £14 5s. 5d. instead of £13, the cost of the home-made mixture. The proprietary article was offered at £19.

The correspondent claims that the manufacturer in making the mixture has to pay double carriage, and in all probability has to use a considerable number of new bags, items which would account for some of the difference between the £14 5s. and the £19.

The composition of the various mixtures is as follows:—

Manure.	Proprietary Article quoted.	Home-made Mixture suggested in Dec. Notes.	The Correspondent's Mixtures.	
			A.	B.
Quantity	20 cwt.	20.75 cwt.	22.5 cwt.	20 cwt.
Cost	£19	£13*	£14 4s. 3d.	£14 5s. 5d.
Ammonia	cwt. 1.4	cwt. 1.41	cwt. 1.59	cwt. 1.59
Soluble phosphate	4.0	3.97	4.05	4.07
Insoluble phosphate	0.5	—	0.29	0.3
Sulphate of potash	1.6	1.58	1.8	1.8

* The mixture would cost £12 10s. 7d. per ton, but 20½ cwt. would be necessary to supply the same amount of plant food as is contained in 1 ton of the proprietary article, and the cost of 20½ cwt. is £13.

It will be observed that the home-made mixture suggested in the December notes approximates closely to the proprietary

article in composition, while the correspondent's mixtures are both better. With regard to the claim that the manufacturer has to pay double carriage and use new bags, it should be pointed out that this would not apply to the larger fertiliser manufacturers, but only to some of the smaller mixers, and that against these items would have to be set the special discount allowed to manure mixers but not to individual farmers. In view of these considerations it can hardly be claimed that a farmer would be justified in paying so high a price for the material in question.

Manuring of Seeds Hay.—In the west and north of England and in Scotland the manuring of the seeds hay is well understood and is a common practice; in the Eastern Counties, however, little if any manuring is done. The difference arises from the circumstance that the seeds hay in the Eastern Counties is generally pure clover intended for one year only, whilst elsewhere it is a mixture containing grasses intended to remain down two or more years. If the land is already in good heart, is sufficiently well limed, and has recently received a good dressing of farmyard manure, the clover will probably want nothing more. For some time, now, however, farmyard manure has been scarce, and good dressings have been the exception rather than the rule. In these circumstances the clover ley may well receive more attention than is usually given to it.

First and foremost it is essential that the land should be well supplied with lime, as any acidity is fatal to the crop.

It is also essential that there should be a sufficient supply of phosphates, and if neither basic slag nor superphosphate has been applied recently to the land, one or other should be given to the clover crop. Farmers in the Eastern Counties may well pay serious attention to the experiments made at Saxmundham on the effect of phosphates on the clover crop. Not only was the yield of clover increased but the succeeding wheat crop benefited considerably also. The unmanured clover gave a yield of 39 cwt. of hay per acre in two cuts in 1914. This yield was raised to 51 and 53 cwt. per acre when 5 and 10 cwt. of slag, respectively, were applied. Four cwt. of superphosphate per acre raised the yield to 56 cwt., which shows a very substantial increase on the unmanured crop. Further, the additional nitrogen fixed by the larger clover crop greatly benefited the wheat crop. After the unmanured clover the wheat crop (also unmanured) gave less than 20 bush. to the acre; after the slagged clover the yields on the two plots were $26\frac{3}{4}$ and $31\frac{3}{4}$ bush., and after the superphosphate $25\frac{1}{2}$ bush., per acre. The succeeding

swede crop benefited from the superphosphate and also the following barley crop where 10 cwt. of slag had been given. The full results were as follows :—

*Yields per Acre produced by One Dressing of Fertiliser.
Saxmundham.*

Plot.	Manurial Treatment, Winter, 1913-14.	1914 Clover Hay, 2 cuts.	1915 Wheat. No Manure to any Plot.		1916 Swedes. 15 tons F.Y.M. applied to all Plots.	1917 Barley. No Manure to any Plot.	
			Corn.	Straw.		Corn.	Straw.
		Cwt.	Bush.	Cwt.	Tons. cwt.	Bush.	Cwt.
1	10 cwt. slag, 30 per cent. . .	53	31·7	34·3	8 5	20·0	18·2
2	5 cwt. slag	51	26·7	34·3	8 10	12·1	21·4
3	5 cwt. slag, 1 cwt. muriate of potash	53	27·9	35·3	8 7½	13·5	21·8
4	None	39	19·7	36·4	8 2½	14·3	16·4
5	4 cwt. 30 per cent. super. .	56	25·4	37·1	9 10	13 5	18·2
6	4 cwt. super., 1 cwt. muriate of potash	60	23·5	38·2	10 10	12·1	18·5

Lucerne also benefited considerably by the application of phosphates. The addition of farmyard manure as well as superphosphate caused a still further increase which might, perhaps, have been even greater had more phosphate been applied. Lime had a useful though less marked effect. The results are :—

Lucerne Experiment, Saxmundham. Commenced 1910.

Plot	Plots dressed *in 1910 and 1913.	Lucerne Hay, Cwt. per Acre.						Total Crop 6 Years.	Pre- War total Cost of Manure.	Total Increase due to Manure
		1911 3 cut- tings.	1912 3 cut- tings.	1913 2 cut- tings.	1914 2 cut- tings.	1915 2 cut- tings.	1916 2 cut- tings.			
1	No manure	20	81·5	54·8	52·3	58	55·5	Cwt. 322	s. d.	Cwt.
2	1 ton ground lime . .	20·5	86·5	60·3	56·3	59·5	67·3	350	50 0	28
3	2 cwt. super., 6 tons farmyard manure . .	20·2	95	72·1	64·5	71·0	65·1	388	72 0	66
4	2 cwt. super.	21·5	91	68·0	58·7	63·0	78·3	381	12 0	59
5	5 cwt. super.	21	92·5	66·4	58·7	69·5	76·7	385	30 0	63
6	2 cwt. super., 1 cwt. muriate of potash . .	19	85	70·7	55·2	68·0	62·1	360	32 0	38

*Saxmundham Report, 1915-18. Ipswich, 1919.

In view of these interesting results it is important that more trials should be made in order to ascertain how far manuring the seeds hay is likely to be helpful.

Scarcity of Farmyard Manure.—It is a common complaint of many farmers that they have less farmyard manure than they would like, and see no way to increase their supplies. On some farms, probably on many, fewer animals are being fattened in yards than is usual at the present season of the year. The farmer who finds himself in this position may adopt one of several courses to help over the difficulty.

1. The greatest care must be taken to avoid waste of such farmyard manure as is available ; methods have been discussed in former notes by which this can be done.

2. A compost may be made of broken straw, hedge clearings and other suitable materials. Such a compost is not as good as farmyard manure, but it has the merit of supplying organic matter and, therefore, may prove distinctly valuable.

3. In place of a one-year clover ley a mixture of clover and grass can be substituted and left down for two or three years. Considerable amounts of humus are thus formed, which, on ploughing in, exert a beneficial effect on the soil.

Rock Phosphates.—A correspondent has asked whether and if so under what conditions rock phosphates can be used in place of basic slag and superphosphate. This question was raised many years ago by the late Dr. Jamieson, but it soon ceased to be of interest because the supplies of superphosphate and basic slag were more than adequate for British consumption ; indeed, considerable quantities were exported. In present circumstances, however, this is no longer the case, and there is now no excess of fertilisers. The question, therefore, arises, whether rock phosphates can be used direct or whether conversion into superphosphate is really necessary.

Experimental evidence has been obtained showing that rock phosphates are of value in the north of England and also in Scotland and Wales ; they have not proved successful, however, at Saxmundham in Suffolk. The following table shows the average of some of the field experiments carried out in Scotland :—

Field Experiments with Phosphates upon Turnips, 1911-14.
(Average of 66 Experiments.)

Plot.	Tons	cwt.
1. No artificial manure	13	17
<i>Sulphate of ammonia, potash manure salts, and—</i>		
2. superphosphate	20	12
3. basic slag	20	0
4. ground mineral phosphate	19	10
5. steamed bone flour	20	7
6. bone meal	19	11
7. dissolved bones	20	3
8. mixture of superphosphate and basic slag ..	20	15
9. mixture of superphosphate and ground mineral phosphate	20	8
10. mixture of superphosphate and steamed bone flour	20	15
11. mixture of superphosphate and bone meal ..	20	11

Farmyard manure was applied equally on all plots at the rate of about 12 tons per acre. Sulphate of ammonia and 30 per cent.

potash manure salt were applied equally to plots 2 to 11 at the rate of $\frac{1}{2}$ cwt. of each per acre. An equivalent amount of phosphoric acid, approximately 50 lb. per acre, was given to each of plots 2 to 11. In plots 8 to 11 one-third of the phosphoric acid was from superphosphate, and two-thirds from the other phosphatic manures.

In these cases the mineral phosphate has proved nearly equal to slag. The difference, though only small, may, however, be real, in view of the large number of experiments involved.

At Cockle Park, Tunisian rock phosphate and Belgian rock phosphate both proved less effective than basic slag, though the difference was not very great. The fertilisers were used at the rate of 200 lb. of phosphoric acid per acre, corresponding to nearly 10 cwt. of 41 per cent. basic slag. The results of the third test carried on from 1913-15 were as follows:—

Cockle Park: 3 Years' Grass Ley. Yield of Hay in Cwt. per Acre.

—	1st Year, 1913.	2nd Year, 1914.	3rd Year, 1915.	Average.
Unmanured	33 $\frac{1}{2}$	37 $\frac{1}{2}$	22	31
Basic slag	44 $\frac{1}{2}$	48 $\frac{1}{2}$	27 $\frac{1}{2}$	40
Tunisian rock phosphate	35	41 $\frac{1}{2}$	30 $\frac{1}{2}$	36
Belgian rock phosphate	41	39 $\frac{1}{2}$	29	36

These figures bring out an interesting property of the mineral phosphates—that they are less useful than superphosphate or basic slag in the early days of the plant growth. Thus they gave a lower yield than slag in the first and second years at Cockle Park; further, it was noticed in Scotland that the braird of arable crops was considerably below that obtained with superphosphate or slag. It has been suggested that the difficulty can be overcome by adding a certain proportion of superphosphate which can be used by the seedling, leaving the mineral phosphate for the older plant.

Experiments in North Wales also indicate that rock phosphate is distinctly effective. At six centres the yields of swedes were:—

	Tons	cwt.
No phosphate	12	18 $\frac{1}{2}$
*Gafsa phosphate (333 lb.)	21	13 $\frac{1}{2}$
*Superphosphate (539 lb.)	22	10

* Both contained 200 lb. of total phosphate.

Broadly speaking, these different results indicate that finely-ground mineral phosphates are worth trial in England west of the line from Durham to Southampton, but that no farmer should rely upon them until a proper comparison has first been made with basic slag and superphosphate. There are many cases in which superphosphate proves invaluable in

promoting early root development, quite apart from its effect on the adult plant ; there is no evidence that mineral phosphates can act in this way. Further, there are many cases in which basic slag has had remarkable effects in regenerating poor pastures ; here, also, there is no evidence that mineral phosphates would act equally well. The average results show that mineral phosphates can produce useful effects on the adult plant under suitable conditions, but not enough is known about these conditions to justify advice to individual farmers as to whether mineral phosphates would be useful to them or not.

It is just a year since it was decided to suspend the issue of these notes. All that time the shortage of all kinds of feeding stuffs was so acute, and the control so stringent, that owners of live stock were constrained to buy what they could get, and advice was of little value. The general situation is now somewhat easier and supplies are improving, so that advice as to the purchase and use of feeding stuffs may once more be of some practical use. These notes will therefore in future appear in the *Journal* every month, and the present article must be considered as introductory.

**Notes on Feeding
Stuffs for February:**

*From the
Animal Nutrition
Institute, Cambridge
University.*

It may be useful to draw attention to some of the more striking lessons of the War and to point out certain facts about the trend of supplies.

Beef Production.—To those who are engaged in the production of winter beef, perhaps the most surprising fact which has emerged from the exigencies of the War is the small amount of concentrated food which is really necessary for full-grown cattle fattening on roots and straw. This fact has been thoroughly established in a series of feeding trials carried out during the War and reported in this *Journal** under the title "War-time Beef Production." Since then the trials have been repeated at the Norfolk Agricultural Station and on the writer's own farm with entirely similar results. In these trials full-grown bullocks on a ration of 1 cwt. to 1½ cwt. of roots, and 10 lb. to 14 lb. of straw or straw and hay, supplemented by only 1½ lb. per head per day of common cotton cake, were ready for the butcher in from 16 to 20 weeks, by which time more than half of them were supergraded. Several typical animals on slaughter yielded over 56 per cent. of dressed carcass. Further,

* Issue for September, 1918, p. 623.

the financial result of such feeding was more satisfactory than that of comparative trials in which a full cake ration was used. This financial result has been further confirmed by several of the more progressive farmers who saw the trials at the Norfolk Agricultural Station and have for the last two years successfully adopted a ration of roots and straw *ad libitum*, and either 1 lb. per day of cake or no cake at all. There is no room for doubt that when cake is dear, and fat bullocks sell for little more per live weight than they cost as stores, the use of an extremely low cake ration is the only chance of avoiding a heavy loss in the production of winter beef. It may be true that the manure made by cattle on such a ration is relatively poorer in nitrogen than where a full cake ration is used, but recent work at Rothamsted on the bacteriology of farm-yard manure throws some doubt even on this contention. Even if it is true, the deficiency of nitrogen can be corrected by supplementing the manuring of the crop to which the dung is applied by a top-dressing of 1 cwt. per acre of sulphate of ammonia. This would cost about 20s. for each animal, which is far less than the cost of 7 lb. of cake per day for 16 weeks, which would be about £7. For the low cake ration fed with a large ration of roots, common cotton cake is the most suitable, for not only does it supply the protein necessary to balance the ration, but its astringent properties tend to prevent the scouring which may result from the consumption of so much succulent food. Its use is also indicated by the fact that the prospect of increased supplies has caused the price to fall to some extent below the maximum of £19 10s. per ton. Some samples have been sold as low as £17 10s. per ton ex-mill, or 4s. 9d. per digestible food unit. Uncorticated or semi-decorticated ground nut cake is also suitable for cattle fattening on roots and straw. It contains more protein than cotton cake but is not so astringent. It is, however, cheaper. At £21 per ton ex-mill it comes to almost exactly 4s. per digestible food unit.

Milk Production.—Although it is both successful and economical to reduce the cake ration for beef production, this is by no means the case in feeding for milk production, since milk contains so much protein that a high ration of cake or some other nitrogenous concentrated food is absolutely necessary for cows on roots and straw or hay in the winter. A 9-cwt. cow requires $\frac{3}{4}$ lb. of protein and from 6 lb. to 7 lb. of starch-equivalent for maintenance. In addition to this she should get $\frac{1}{2}$ lb. of digestible protein and $2\frac{1}{4}$ lb. of starch-equivalent for each gallon of milk she gives. A maintenance ration can be provided by $\frac{3}{4}$ cwt. of roots and a stone of hay or straw.

If the latter, about 1 lb. of cake should be given to ensure the requisite ration of protein, since both roots and straw are deficient in this constituent. To this maintenance ration must be added about 3 lb. of concentrated food for each gallon of milk. It is wiser to give a mixture of several concentrated foods rather than any one such food alone. Feeding stuffs suitable for milch cows are :—

	s.	d.	
Bran, at £12 10s. per ton ex-mill ..	=	3 3	per food unit.
Dried Ale Grains, at £15 per ton ex-wharf ..	=	3 0	"
Palm Kernel Cake, at £13 per ton ex-mill ..	=	2 9	"
Decorticated Ground Nut Cake, at £20			
per ton ex-mill	=	3 10	"
Linseed Cake, at £25 per ton ex-mill ..	=	4 2	"

It is necessary to point out that in order to make a fair comparison between the costs of these feeding stuffs possible, the ex-mill or ex-wharf prices ruling in London about 8th January have been quoted. Prices might vary slightly in other parts of the country. The prices do not include the cost of bags. A farmer purchasing through a dealer would also have to pay over and above these prices any transport charges incurred, and in some cases a sum to represent the dealer's profit. Purchases of small quantities from local dealers would, of course, be at higher rates.

Palm kernel cake is much the cheapest of these feeding stuffs and is particularly suitable for milch cows. It should form half the mixture; the balance may be bran and decorticated ground nut cake. The writer's cows have given excellent results on this mixture for the last two months.

Pig Feeding.—The troubles of the pig keeper as regards food are by no means over. Pigs are, or were, fed for the most part on cereals or cereal products, and there were annually available of these feeding stuffs from 1909 to 1913 an average of about 1,400,000 tons of millers' offals, 2,000,000 tons of maize (of which a small proportion was used for industrial purposes), 1,000,000 tons of barley and 300,000 tons of brewers' grains, together with considerable quantities of rice meal, etc. The present production and importation of millers' offals appear to be at the rate of 1,500,000 tons, and of maize 750,000 tons per annum. The quantity of barley and its products available for feeding purposes during the present year is likely to be at least equal to that consumed before the War. There is, therefore, a reduction of 20 to 25 per cent. in the supply of cereals and cereal products suitable for pigs. As a set-off against this deficit there is a similar reduction in the total number of pigs in the United Kingdom, and there is no doubt that during

the War pig keepers learned to use many foods which they had neglected before, *e.g.*, extracted palm kernel meal, roots and refuse materials of all kinds. The practice of keeping pigs in the open also increased during the War, and is to be commended.

Supplies of Feeding Stuff.—The cereal supply has already been referred to as regards millers' offals, maize and barley. The supply of home-grown oats is about 3 million qr. greater than the average supply available annually from 1909 to 1913, for though the yield in 1919 was poor a considerably larger average had been sown. There seems no reason to anticipate serious difficulty in importing any additional quantities that may be required.

The supplies of cakes of all kinds seem to show signs of improving, and in many cases the prices on the market are below the maximum. The chief difficulty is in distribution.

THE necessity for very careful grading and packing of fruit, particularly apples, is continually being emphasised by all sections of the fruit trade, including growers. Notwithstanding the fact that growers are fully aware of this need, and although propaganda work continues unceasingly year after year, little progress is made.

**Apple Packing at
the Eastern Counties
Commercial Fruit
Show.**

One of the best means of impressing backward growers of the necessity for good packing is through commercial fruit shows, such as those held recently at Maidstone, Cambridge, Cheltenham, Gloucester and Pershore. These exhibitions of apples packed on the best commercial lines enable growers to compare their fruit, and the way it is packed, with their neighbour's. Competitions of this description are invaluable as a means of introducing and emphasising improved methods, and of inducing their permanent adoption.

It is regrettable that few growers are able to attend regularly the large distributing markets such as London, Birmingham, Manchester, Newcastle, Glasgow, etc., and see the condition of their fruit on arrival, compare it with that of their competitors at home and abroad, and become convinced of the increased returns obtained from fruit which has been well packed and attractively marketed compared with equally good samples of fruit which are, however, bruised and badly put up. Were this possible a great improvement would almost certainly soon take place, but failing this, the Commercial Fruit Show provides the best method of convincing growers.

In order to illustrate the common faults met with in apple packing, and to suggest and urge how these may be overcome,



FIG. 1.

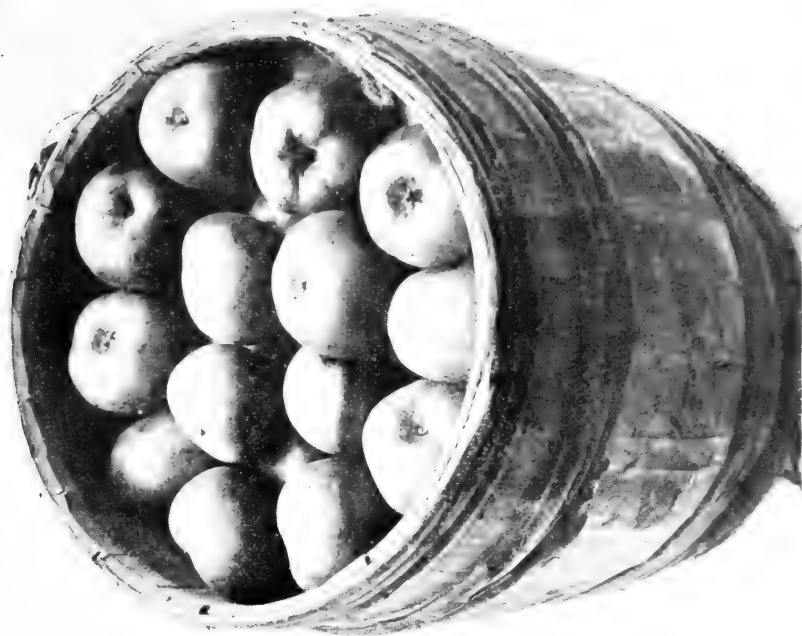


FIG. 2.



FIG. 4.

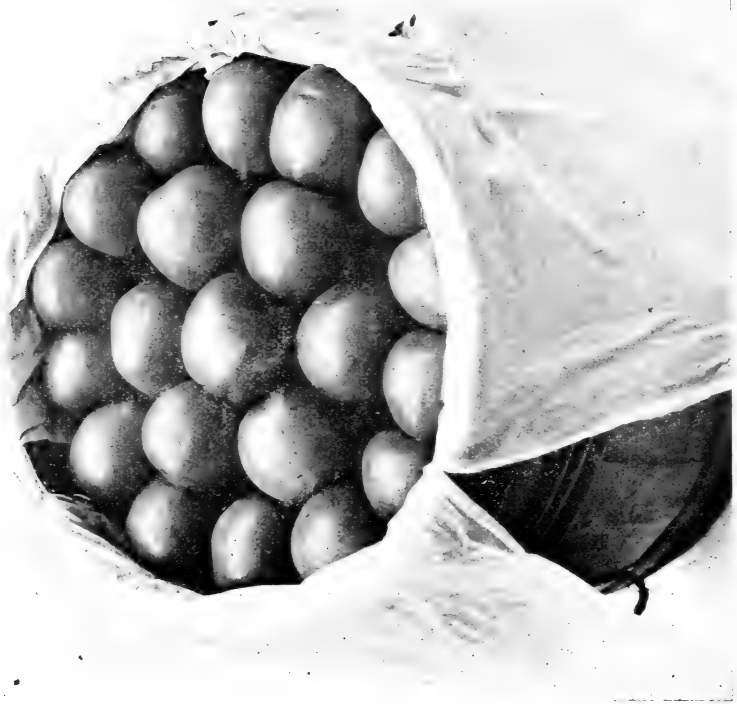


FIG. 3.



FIG. 5.



FIG. 6.



FIG. 7.

the photographs published with this note were taken at the Cambridge Commercial Fruit Show at the suggestion of the Board. The variation in the quality of the packing at this Show was astounding. These photographs do not in any way exaggerate this regrettable lack of uniformity.

No matter what package is used, there is a right and wrong method of packing, and the following essential points must be strictly adhered to if the produce is to look attractive when it arrives at the wholesale market :—

1. *HONEST GRADING*, both as to size and quality—*no "topping."*
2. *FULL PACKAGES AND FIRM PACKING*.—The fruits should be packed so that each is held in position by its neighbours. Only in this way can *the package be filled* and bruising of the fruit reduced to a minimum.
3. *THE MINIMUM USE OF PACKING MATERIAL* required to prevent bruising those apples which touch the side of the package.

Not only does strict adherence to these essentials ensure the fruit arriving at the market in an attractive condition, but, equally important, an impression is soon made on the buyers and their confidence is obtained. Filling the packages completely is most important in this connection. Growers who do not attend the markets and see their produce sold never realise the importance of gaining the complete confidence of the final wholesale purchaser of their produce. They do not appraise the value to themselves of this sense of security to the purchaser in terms of pounds, shillings and pence.

The time a retail buyer is able to spend in the market purchasing his supplies is, of necessity, very limited, and if a large quantity of fruit has to be purchased extra time cannot be wasted in estimating carefully the proportion of sound and unsound, or large and small fruit in an ungraded sample. If the retail buyer must buy ungraded and badly-packed fruit he only gives a price which, from his point of view, is safe to produce a profit after allowing for waste. Such a price is always a poor one to the grower. On the other hand, fruit well packed and graded soon gets a name for the grower. The buyer knows that he can rely on the sample and can buy without undue risk, even on the consignment note. Further, competition amongst buyers is promoted and the salesman, by taking advantage of this, is able to return an enhanced price.

Attention is called to the following points brought out in the illustrations :—

Barrel Packing (Figs. 1, 2, 3).—In Fig. 1 the fruits have been poured into the barrel, which has not even been filled. The packing materials consist of a little crumpled paper and straw. (The straw is quite unnecessary up the side of a barrel; it is only required for the head and tail.) Although this particular package had only travelled a short distance to the show, much of the fruit had already been damaged by bruising. What value would such a sample have on the open market? The fruit is bruised, the package only three parts full. If the grower and his packer could hear the remarks passed by retail buyers on a sample of this description they would never pack like it again.

The barrel in Fig. 2 has a better appearance than that shown in Fig. 1 and is full. The fruits, however, are not packed tightly and are bound to bruise as they are rattled about by the rail and market porters. Besides, the appearance would have been greatly improved by an ample lining of white paper.

Fig. 3 shows a well-packed barrel. Nothing could look better. It is full. The fruits hold each other tightly together and cannot bruise. The grading is good. The apples look attractive as they are packed on their cheek and not eye up; they are shown off by means of ample white paper.

Bushel Packing. (Fig. 4).—The principles underlying packing in bushels are very similar to those for barrels, but Fig. 4 illustrates how easily a good pack can be spoiled. The hay has been used to counteract slack packing, but its use completely destroys the appearance of the sample, and down goes the market value in consequence.

Box Packing (Figs. 5, 6, 7).—Unfortunately the cost of non-returnable apple boxes at the present time restricts this system of packing to high-quality samples. Nevertheless, as an effective means of displaying the fruit, and of giving the buyer the full quantity of fruit to which he is entitled, this form of package is admirable. No doubt, when timber becomes cheaper, this package will again come to the fore.

Success in box packing depends very largely on perfect grading and tight packing—to obtain the latter the minimum of packing materials (woodwool and paper) should be used.

Fig. 5 shows a box of Lord Derby's packed properly.

Fig. 6 shows some fine Allington Pippins, but the box is only half full owing to the amount of paper which has been used. If the apples are very choice, it is sufficient for the box to be packed on exactly the same principle as Fig. 5, but with each apple wrapped in absorbent tissue paper.

Fig. 7 shows inferior packing, which is slack, and with the lining paper used carelessly.

In response to certain potato dealers' expressions of difficulty in correlating the various Regulations concerning the use and distribution of seed potatoes, the following summary has been prepared :—

**Seed Potato
Regulations.**

In the first place, dealers in potatoes of any kind must obtain a certificate of registration as a dealer, wholesale or retail, as the case may be, from the Ministry of Food. (The Potatoes Order, 1919, issued by the Ministry of Food.*)

In the case of any Sale, dealers must correctly declare to the purchaser on the invoice, sale note, or label, the variety, class, and size of dressing of the seed potatoes sold. With regard to the "class," Class 1 comprises Scotch and Irish seed; Class 2, seed once grown; and Class 3, seed twice grown from Scotland or Ireland. (The Seed Potato Order, 1918, issued by the Ministry of Food.†)

In the case of a purchase of Seed from Ireland, dealers must buy only from a holder of a licence issued by the Department of Agriculture and Technical Instruction for Ireland and request the seller to see that the consignment is accompanied by a certificate issued by the Department to the effect that the potatoes have been inspected and passed as sound. (The Potatoes (Export from Ireland) Order, 1919, issued by the Ministry of Food.)

In the case of a purchase of Seed from Scotland, dealers must obtain from the grower a declaration that Wart Disease has not occurred on the farm from which the seed is coming, and from the Board of Agriculture for Scotland, not more than seven days before the potatoes are consigned, a certificate that Wart Disease has not occurred, either on the farm, or within one mile of the farm. So that the delivery of seed potatoes may not be delayed, it will be sufficient if the loader rather than the purchaser obtains both declaration and certificate, provided that the loader declares in writing to the purchaser on the invoice that he holds these documents. (The Wart Disease of Potatoes (Scottish Seed Potatoes) Order, 1919, issued by the Board of Agriculture and Fisheries.‡)

In the case of a Sale of Immune Varieties for planting within an Infected Area, if the dealer holds stocks of seed potatoes from crops which were inspected whilst growing and certified by the Board of Agriculture and Fisheries, the Board of Agriculture

* See this *Journal*, December, 1919, p. 946.

† " " " January, 1919, p. 1235.

‡ " " " April, 1919, p. 106.

for Scotland, or the Department of Agriculture and Technical Instruction for Ireland, as true to type and reasonably free from rogues, he must furnish the buyer in the invoice or other written document with the serial number of the certified stock in question. It is, of course, an offence to sell as of an approved immune variety seed potatoes not of an approved immune variety, or to sell as certified stocks, stocks which have not been so certified. Immune varieties not so certified cannot be sent into an Infected Area unless a licence has been obtained from the Board of Agriculture and Fisheries, but it should be noted that the Board do not propose to issue such licences until they are satisfied that the supply of certified stocks has been exhausted. (The Wart Disease of Potatoes Order, 1919, issued by the Board of Agriculture and Fisheries.)*

In the case of Varieties not immune from Wart Disease stored in shops and warehouses within, for the supply of Customers outside, an Infected Area, dealers must obtain a licence from the Board of Agriculture and Fisheries and strictly adhere to the conditions of such licence. (The Wart Disease of Potatoes Order, 1919, issued by the Board of Agriculture and Fisheries.)*

In the case of a Sale of Potatoes for planting in land not within an Infected Area, dealers must sell only those varieties which have been grown in clean districts. It should be noted that certified stocks of immune varieties bearing the letter "I" before the serial number have been grown within an infected area. (The Wart Disease of Potatoes Order, 1919, issued by the Board of Agriculture and Fisheries.)*

Any seed potato dealer experiencing difficulty with regard to any of the above Regulations should communicate with the Secretary, Horticultural Division, Ministry of Agriculture and Fisheries, 72, Victoria Street, London, S.W. 1.

BEE-KEEPERS will find that it is cheaper to make their own candy than to buy it, and the following hints may be useful to those who for any reason prefer the home-made variety. It is well to remember that during winter bees should be fed on soft candy placed over the clustering bees under the quilts; syrup is used for spring, summer and autumn feeding.

Soft candy can be made as follows :—Have a clean pan, for preference a brass preserving one, into which put 3 lb. of best white lump cane sugar (brown sugar should on no account be used) and half a pint of water, together with as much cream of tartar as can be heaped upon a sixpenny-piece. Stand beside the fire, stirring occasionally until the sugar is dissolved, and then place on the fire and stir continually until the mass

* See this *Journal*, November, 1919, p. 841.

boils. Allow it to boil for about two minutes, and then remove from the fire and stand the pan in another vessel containing cold water until the sugar begins to cloud; then stir well and pour into prepared glass-topped boxes made by glazing one side of a section, or into saucers lined with paper, so that when cold it can be lifted out in a block. When set, it should be a moist solid mass easily cut into with the finger nail.

Candy given in January should have about a quarter of a pound of pea flour mixed with the above quantity. This is best done during the cooling process. The flour should not be poured in all at once, but lightly sprinkled in while stirring, so that it mixes evenly right through the candy.

When the candy is made with plain sugar it is advisable to medicate it with a disinfectant. Izal, Bacterol, or Flavine can be used for this purpose in the following proportions:—

One teaspoonful of Izal to 8 lb. of sugar.

One teaspoonful of Bacterol to 1 lb. of sugar.

One grain of Flavine to 1 lb. of sugar.

To medicate when dealing with Foul Brood there should be added to each pound of sugar as much Naphthol Beta as can be heaped upon a three-penny piece. This should be dissolved in sweet spirit of nitre, whisky, or methylated spirit. The disinfectant in all cases should be added when the syrup or candy is cooling, not when it is hot.

The Royal Commission on the Sugar Supply have agreed to issue to all registered bee-keepers a ration of bee food of 6 lb. of sugar per stock for the period January to May, 1920.

Government Policy.—The Parliamentary Secretary to the Board, in reply to a question by Major Courthope, stated that a Bill was being drafted by the Board to carry out generally the agricultural policy outlined by the Prime Minister, but that he was not in a position to give details at the present moment. As stated by the Prime Minister the Bill will be introduced early next Session. (8th December, 1919.)

Compulsory Ploughing Orders.—In reply to a question by Sir F. Blake, the Parliamentary Secretary to the Board stated that the Government's scheme for increasing the area under the plough was carried out in 1917 and 1918 as an emergency measure necessitated by the pressing need for rapidly increasing the home production of food. The work was undertaken by local committees of practical men familiar with the districts. Farmers were, as a general rule, notified of the intended visit of the person or persons deputed to select grassland to be broken up. They were also invited to suggest suitable land, and, in any case, every farmer had ample opportunity after he had been served with a Cultivation Order of stating his views to the committees and of suggesting alternative land. It was competent for any person who considered that he had suffered loss as a result of a compulsory ploughing Order to submit a claim for compensation to the Board through his County Agricultural Executive Committee up to the 31st July last. (18th December, 1919.)

Flax Proposals.—Replying to Major Courthope, the Parliamentary Secretary to the Board stated that in order to preserve the goodwill of the Board's flax factories and their products (whether the factories were in future carried on by the Board, or by private enterprise), the Board propose to contract, if possible, for 5,000 acres of flax to be grown in 1920. The price offered will be £13 per ton, with a possible bonus of £2 per ton at the Board's discretion, for flax of exceptionally high quality, seed to be provided free. Purchasers of the factories will be required to take over these contracts, as indicated in the advertisements which have appeared. (8th December, 1919.)

Hops.—In a question by Mr. McCallum Scott the Parliamentary Secretary to the Board was asked whether under the Defence of the Realm Act the acreage under hops has been reduced from about 36,000 to about 16,000 acres, and whether the Government contemplated any special legislation to protect the cultivation of hops in this country. In reply the Parliamentary Secretary to the Board stated that the area under hops was reduced under the Defence of the Realm Act from 31,352 acres in 1916 to 15,666 acres in 1918, and that the area this year was 16,748 acres. Trading in English hops of the 1919 crop had not yet commenced, and the Hop Control Committee had no information as to the prices at which imported hops were being sold in this country. With regard to the last part of the question he referred the Hon. Member to Section 9 (1) (d)* of the Imports and Exports Regulation which is at present before the House.

The Parliamentary Secretary, in answer to further questions by Mr. McCallum Scott, stated that he was aware that an average price was being paid by the Hop Control Committee of £18 5s. a cwt. They were now busy grading the crop, and he could not say at what price any quality was being sold. He also stated that English hops of the 1919 crop were not being sold at a considerably lower price than imported hops. (8th December, 1919.)

Feeding Stuffs.—In reply to a question by Mr. Herbert, the Parliamentary Secretary to the Ministry of Food stated that all descriptions of feeding cakes and meals might be freely purchased. The only form of control now in existence was a system by which the sales of feeding cakes and meals were licensed by an association of the traders acting in co-operation with, and under the supervision of, the Ministry of Food, for the purpose of eliminating speculators and limiting prices. No restrictions were imposed on the freedom of farmers to purchase feeding cakes and meals as and where they please, for their own use. (15th December, 1919.)

Fertilisers.—In reply to a question by Lieut.-Col. Sir N. Griffiths, the Parliamentary Secretary to the Board stated that the Fertilisers Prices Order, 1918,† under which control was exercised over sales and purchases of the fertilisers, ceased to operate on 31st May, 1919. Since that date maximum delivered prices of basic slag and sulphate of ammonia for home deliveries had been fixed by agreement between manufacturers and the Board. No maximum prices had been arranged for superphosphate on account of the varying cost of importing phosphate

* "With a view to assisting the industry of hop-growing in the United Kingdom to recover from the injury which it has suffered during the present War, at any time within a period of four years from the termination of the present War, the Board of Trade will prohibit the importation of hops."

† See this *Journal* May, 1918, pp. 220-221, and June, 1918, p. 359.

rock. Apart from these arrangements, the production, distribution, and prices for home consumption of these fertilisers were now free from control. Control of export of fertilisers was still maintained, in order to secure sufficient supplies to meet home requirements. Export licences for any surplus were, however, freely granted. This control would be discontinued as soon as practicable, consistent with meeting the needs of British agriculture. (22nd December, 1919.)

Grassland.—In reply to a question by Major Howard, the Parliamentary Secretary to the Board stated that the Board were aware that a certain amount of recently-ploughed grass land was being resown with grass, but that he hoped that the declared policy of the Government with regard to agriculture would allay the apprehensions of farmers and encourage them to maintain and extend the area of arable land. (22nd December, 1919.)

Butter and Cream.—In reply to a question by Sir R. Thomas as to the present controlled price of butter, and of Lieut.-Colonel Weigall as to the present veto in the sale of cream, Mr. Roberts stated that he was aware that the maximum retail price of butter was not on a parity with the price of milk, but that the present scarcity of butter was mainly due to the serious reduction in the quantity of imported butter available. As he had already stated, he was considering the question of freeing all home agricultural products, except wheat, at some point or points during the first six months of next year (*i.e.*, 1920), and the remission of the present restrictions on the sale of cream would be dealt with in connection with the general question. (22nd December, 1919.)

Bee Disease.—In reply to a question by Lieut.-Col. Bell, the Parliamentary Secretary to the Board stated that the Board were aware that British beekeepers had during recent years suffered severe losses owing to the prevalence of disease, and particularly Isle of Wight disease, among bees. With the object of preventing these losses by the means of combating disease, the Board had established an institute for the study of bees and bee disease, and at the present time investigations were being carried out both at Oxford and at Cambridge. The Board have, moreover, as a result of inquiries which they had made during 1918, satisfied themselves that hybrid bees of Italian and Dutch origin possess a marked resistance to Isle of Wight disease, and they had accordingly, and with the co-operation of county committees, introduced a Bee Restocking Scheme to establish breeding apiaries for the production of resistant hybrids. In accordance with this scheme they had introduced Dutch stocks and Italian queens, and supplied them at reduced prices to the Committee for breeding purposes. The scheme was developing satisfactorily, and during 1919, 1,171 hybrid nuclei had been raised from 251 stocks. It was proposed to continue the production of nuclei in the coming year, and it was expected that it would result in the establishment of large numbers of resistant bees. To ensure this result the Board hoped to provide for further importation of Italian queens during 1920. The question of introducing legislation with the object of stamping out bee diseases was now under the consideration of the Board. (22nd December, 1919.)

OFFICIAL NOTICES AND CIRCULARS.

CONSEQUENT upon the passing of the "Ministry of Agriculture and Fisheries Act, 1919,"* the King has been pleased to appoint the Right Hon. Lord Lee of Fareham, G.B.E., K.C.B., to be Minister of Agriculture and Fisheries.

**Appointment of
Minister
of Agriculture.**

THE Rats and Mice (Destruction) Act, 1919, which received the Royal Assent on the 23rd December, came into operation on the 1st January. The powers vested in Local Authorities under the Act are briefly explained in a Circular Letter addressed to Local Authorities by the Board on 30th December. The Board point out that, although an "occupier" of "land" is required under a penalty of £5 to take action to free his premises of rats and mice, provision is made for service by the Local Authority, or any Committee of the Local Authority to which the exercise of powers may be delegated, of a Notice on the "occupier" requiring him to take such steps as are prescribed in the Notice, within a time specified therein, and that this can be enforced by a fine of £20. The Local Authority may also, after not less than 24 hours' notice to the "occupier," enter upon the "land" and take such steps as are necessary and reasonably practicable for freeing the premises from rats and mice, and may recover all reasonable expenses so incurred. A notice purporting to be signed by the Clerk of a Local Authority shall, in the absence of proof to the contrary, be deemed to have been signed by the Clerk with the authority of the Local Authority. The expression "occupier" means, in the case of land which is unoccupied, the owner; and "land" includes any buildings and other erection on land, and any cellar, sewer, drain or culvert in or under land. The Act applies to a vessel as if the vessel were land, and the Master shall be deemed to be the occupier. Proceedings under the Act are only to be instituted by or with the authority of the Board or the Local Authority.

Experience gained by the Board from the supervision of administration of the Rats Orders has demonstrated that without the services of a competent and trustworthy officer to organise and control the necessary measures, the general co-operation and uniformity of action which are essential to success cannot be secured. It has shown on the other hand that where such officers are appointed a scheme on self-supporting lines can be organised and valuable results achieved. Local Authorities are urged, therefore, to adopt this procedure without delay.

THE following Circular Letter (No. 264/C.6) was addressed to County Councils and Councils of County Boroughs in England and Wales by the Board on 22nd December last:—

**Present Position of
Land Settlement.**

SIR,—I. I am directed to forward for the consideration of your Council the enclosed extracts† from the Proceedings of the Conference held on 21st October last between the President of the Board and representatives of Small Holdings Committees of the County Councils.

* See p. 962.

† Not here printed.

2. Lord Lee desires me to take this opportunity of expanding and emphasising certain points to which he referred, as some members of the Committees seem still not quite clear as to the Board's policy.

3. *Preference to ex-Service Men.*—I am to lay stress on the necessity for giving an absolute preference to ex-Service men. The amount of twenty millions provided in the Act for Great Britain will be no more than adequate to provide holdings for ex-Service applicants, and, until their claims are satisfied, it is imperative that none of it be spent on settling civilians except in very special cases.

So strongly does Lord Lee feel on this matter that Councils are asked to enter into no arrangements for letting a holding to a civilian applicant unless they receive the written concurrence of the District Commissioner.

4. *Applicants cannot dictate Choice of Land.*—Some Small Holdings Committees seem to think that if applicants demand holdings near their present homes or in some particular district, land must be specially acquired to meet their wishes.

This is wholly a mistaken view of the Government's pledge to ex-Service men, which was simply to provide suitable holdings; not to acquire scattered pieces of land to suit individual tastes.

The latter method, if pursued, will involve the Government in serious and needless expenditure on compensation for severance (by cutting small holdings off existing farms) and extra cost in building isolated cottages, and will saddle the Council with more difficult and costly management in the future.

Moreover, it is contrary to the declared policy of the Board, which is to group small holdings together in large blocks, so that the settlers, by co-operative purchase and marketing, may have the best chance of securing a good livelihood.

Exceptions to this general rule should be few, but may include the provision of land without equipment in small parcels for men who have other occupations.

5. *Rents of Council Holdings.*—Several counties have pointed out to the Board that in present conditions there is a danger of the rents charged to ex-Service men being higher than those paid by pre-war tenants of the Councils for similar holdings. The opinion has been expressed that it would be grossly unfair if a man who had risked his life in the service of his country were settled on a holding adjacent to another man who had remained on the land throughout the War, and were required to pay a rent 50 per cent. or 60 per cent. higher than his neighbour.

The problem is admittedly a difficult one, and has been fully considered by the Cabinet. As a result the Government desire each Council to reconsider forthwith the existing rents for pre-war holdings and to make such additions thereto as will bring them into closer agreement with the changed value of agricultural land. In determining the amount of the new rent, Councils should not take into account improvements effected by their tenants. Nor should they have regard to the change in the rate of interest charged on loans raised now for the purchase and equipment of land. The Government do not desire Councils to rack-rent their tenants. They are satisfied, however, that in view of the advance in the capital value of agricultural land, the rents of County Council small holdings should, in most cases, be considerably increased and brought into relation with the rents charged by private

landowners, who work on a commercial basis, for small holdings similar in character to those provided by the County Council.

In this connection I am to remind the Council that in 1926 the small holdings undertakings will be valued as a whole on the basis of their then rental value. If the Council is not then obtaining rents equal to their full rental value the loss will fall on the Council itself.

6. *Advances to Settlers.*—The Regulations have now been made by the Treasury, and copies are enclosed herewith* with copies of a covering memorandum.†

I am, etc.,

(Signed)

LAWRENCE WEAVER,

Director-General of Land Settlement.

THE following Regulations, dated 8th December, 1919, have been made by the Treasury under Section 18 of the Land Settlement (Facilities) Act, 1919 (9 and 10 Geo. 5 Ch.

**Loans to Tenants
of Small Holdings
under the
Land Settlement
(Facilities) Act, 1919.**

59) :—

In pursuance of the powers conferred on them by Section 18 of the Land Settlement (Facilities) Act, 1919,† My Lords make the following Regulations :—

1. Any application by a tenant or prospective tenant of a small holding provided by a County Council for an advance or guarantee of an advance under the above section shall be addressed to the Clerk of the County Council.

2. Every application shall state the purpose or purposes for which the advance is required, which must be one or more of the following purposes, namely, the purchase of live stock, fruit trees, seeds, fertilisers and implements required for the purposes of the holding. The application shall contain an undertaking to apply the money advanced for the purpose authorised, and that if the money is used for any other purpose the Council may require its repayment forthwith.

3. The applicant shall state in every case the capital in cash or kind, other than the advance, which is or will be available for farming his holding, and whether any part of such capital is or represents borrowed money.

4. A County Council shall limit the sum to be advanced to any applicant to such amount as in the opinion of the Council does not exceed the amount of capital in cash or kind which the applicant is able to provide from other sources, except in any special case where the Council are of opinion that a larger amount might safely be advanced to the tenant, and the previous sanction of the Board of Agriculture and Fisheries has been obtained by the Council.

5. The amount of the advance shall not exceed the sum which the Council consider necessary for the purpose stated in the application, and in no case shall the advance or advances to any one applicant at any time exceed £500.

* See below.

† Not here printed.

‡ See this *Journal*, October, 1919, p. 735.

6. The period for the repayment of an advance shall be determined by the County Council at the time of sanctioning the advance, and must not be extended subsequently except with the specific approval of the Board of Agriculture and Fisheries. The period shall be determined in accordance with the following rules :—

- (a) The period of each advance shall not exceed the period during which in the opinion of the Council the applicant may reasonably expect to recoup the expenditure proposed ; and
- (b) In the case of advances for the purchase of live stock, fruit trees and implements, the period shall not exceed three years, provided that in exceptional cases it may, with the special sanction of the Board of Agriculture and Fisheries, be extended to the maximum of five years from the date of the advance, and in the case of advances for the purchase of seeds or fertilisers the period shall not exceed two years.

7. On approval of an application instructions given by or on behalf of the Council will be sent to the applicant's Bank by which the money will be advanced to the applicant as he requires it, and such instructions will cover the Bank's advances up to the amount authorised by the Council on the amount and for the period which the Council authorise the advance to be made with interest at a rate not exceeding five per cent. The Council will give to the Bank a guarantee for such advances and interest in such form as they may agree. An advance shall not be made by a County Council otherwise than through the applicant's Bank except with the sanction of the Board of Agriculture and Fisheries.

8. At the time of approving an application for an advance the Council shall determine within what period the applicant shall be required to satisfy them by the production of receipted invoices, or otherwise, that the advance has actually been expended for the purpose for which it was sanctioned. If an applicant fails to comply with any such requirement the Council may by notice to the applicant and the Bank reduce the amount of the advance authorised and require repayment by the applicant forthwith of any amount expended for a purpose for which it was not sanctioned.

9. The interest payable to a Bank in respect of an advance made under these Regulations shall be paid quarterly, or at such other intervals as the Bank shall determine.

10. In any case of default in regard to the repayment of any advance reported by the Bank to the County Council, the Council will repay to the Bank the amount due under their guarantee and take all possible steps to secure repayment. If any amount proves irrecoverable it should be reported by the County Council to the Board of Agriculture and Fisheries.

11. A Bank advancing money on a guarantee under these Regulations shall not be responsible for the application of the money advanced.

12. Advances under these Regulations shall only be approved where in the opinion of the County Council the facilities for obtaining advances from a society on a co-operative basis are inadequate.

13. These Regulations apply to tenants of Holdings provided by a Council of a County Borough with the following modifications :—

- (a) For " County Council " there shall be substituted " Council of a County Borough," and
- (b) For " Clerk of the County Council " there shall be substituted " Town Clerk,"

and to the tenants of holdings provided by the Board of Agriculture and Fisheries with the following modifications :—

- (i.) For "County Council" there shall be substituted "Board of Agriculture and Fisheries," and
- (ii.) For "Clerk to the County Council" there shall be substituted "The Secretary to the Board of Agriculture and Fisheries."

Given under our hands this 8th day of December, 1919.

(Signed) JAMES PARKER.

" J. TOWYN JONES.

*Two of the Lords Commissioners of
His Majesty's Treasury.*

THE Food Controller has issued an Order amending the Potatoes Order, 1919.* The effect of the new Order is to prohibit the use of any potatoes which are fit for human consumption (except potatoes which will pass through a $1\frac{1}{4}$ -in. riddle) for any purpose other than planting or human consumption.

**Potatoes Order, 1919:
Amendment.**

Such potatoes may not be used for the manufacture of spirits or farina or for the manufacture of any article which is ordinarily used for any purpose other than human food. The Order came into force on 1st January, 1920, and does not apply to Ireland.

AN Order (No. 1806), dated 6th December, 1919, has been made by the Food Controller revoking as on the 15th December, 1919, the British Onions Order, 1918,† but without prejudice to any proceedings in respect of any contravention thereof.

**The British Onions
Order, 1918.**

THE Food Controller has made an Order (No. 1798), dated 4th December, 1919, to the effect that :—

**The Cheese
(Distribution) Order,
1918.**

1. On and after the 9th December, 1919, until further notice, no Government cheese which is produced in the United Kingdom shall be sold by retail at a price exceeding a price at the rate of 1s. 8d. per lb.

2. (a) No charge may be made for packing or packages or for giving credit.

(b) Where the cheese is delivered at the buyer's request otherwise than at the seller's premises, an additional charge may be made in respect of such delivery not exceeding a charge at the rate of $\frac{1}{2}$ d. per lb., or any larger sum actually and properly paid by the seller for carriage.

3. The directions under the above Order (The Cheese (Distribution) Order, 1918), dated the 8th March, 1919,‡ are hereby revoked as from the 9th December, 1919, so far as the same relate to Government cheese produced in the United Kingdom, but without prejudice to any proceedings in respect of any contravention thereof.

* See this *Journal*, December, 1919, p. 946.

† See this *Journal*, November, 1918, p. 1006.

‡ Not printed in this *Journal*.

THE Food Controller issued an Order (No. 1686), dated 22nd November last, which fixes the maximum prices at which, and prescribing the condition under which, all eggs

Egg Prices. other than plovers' and gulls' eggs may be sold. The principal provisions of the Eggs (Prices) Order, 1918,* are re-enacted, and the schedule of maximum prices given in that Order remains unaltered, except that maximum prices are fixed for Chinese eggs, the maximum retail prices for which are 4d. each.

AN Order (No. 1826), dated 10th December, 1919, has been made by the Food Controller revoking as from the 15th December, 1919, the Horse and Poultry Mixtures Order, 1917, as amended,† but without prejudice to any proceedings in respect of any contravention thereof.

AN Order (No. 1847), dated 13th December, 1919, amending the Poultry and Game (Prices) Order, 1918, has been made by the Food Controller to the effect that:—

1. Sub-Clause (iii.) of Clause 4 of the (Prices) Order, 1918. Principal Order‡ shall be deleted.
2. The Schedule to this Order shall be substituted for the Schedule to the Principal Order.

THE SCHEDULE.

Maximum Prices for Poultry and Game.

	First Column. (Retail.)		Second Column. (Other than retail.)	
	Price at the rate per lb.	Price for the Bird.	Price at the rate per lb.	Price for the Bird.
	<i>s. d.</i>	<i>s. d.</i>	<i>s. d.</i>	<i>s. d.</i>
Ancona and Leghorn (white, black or brown) Cockerels weighing not less than 6 oz., and not more than 1 lb.	—	2 2	—	2 8
Any other Cockerel and any Pullet, Cock or Hen, including Capon	2 2	—	2 8	—
Domestic Duck	1 10	—	2 3	—
Turkey	2 2	—	2 8	—
Goose	1 4	—	1 8	—
Guinea Fowl	—	5 6	—	7 0
Grouse and Black Game . .	—	2 6	—	3 3
Partridges, young birds (hatched in the year 1919, sold prior to 1st January, 1920)	—	3 3	—	4 0
All other Partridges . . .	—	1 9	—	2 3
Pheasants (Cocks)	—	5 6	—	7 0
„ (Hens)	—	5 0	—	6 6

* See this *Journal*, December, 1918, p. 1128.

† „ „ December, 1917, p. 1023, and June, 1918, p. 353.

‡ „ „ August, 1918, p. 600, and October, 1918, p. 901.

THE Board again call the attention of nurserymen and others to the new Gooseberry Mildew Order which revokes all previous Orders dealing with this disease except the Fruit
American Gooseberry Orders of 1915 and 1919,* (Orders referring
Mildew. to the importation of fruit and the consignment of diseased fruit to markets).

Under this Order notification of disease is required from persons growing gooseberry and currant bushes for sale. It is illegal to sell gooseberry or currant bushes affected with the disease, but a grower, after notification, may prune away all diseased tips and then sell the bushes without a licence. The onus of seeing the bushes are free from disease rests with the seller. All restrictions on the movement of gooseberry or currant bushes which have been in force in Wisbech, Kent, Worcester, etc., are removed, but the new Order enables an inspector to forbid the removal of visibly diseased bushes and also to deal with diseased bushes moved in contravention of the Order. The Board retain power under the Order to deal with fruit growers and private owners who fail to take proper steps to check the disease.

The importation of gooseberry bushes is still prohibited, but that of currant bushes is now allowed without licence.

The Board regret to find nurserymen and growers of bushes for sale are not exercising the necessary care and removing the tips before selling the bushes. The Board will strictly enforce the provisions of the Order dealing with the sale of diseased bushes, and in such cases of contravention reported to them are instituting legal proceedings.

FOR a long time past large tracts of sheep-farming land in Scotland and the North Tyne district of England have known a sheep disease popularly called Louping-ill. Of late it has

**Louping-ill in
Sheep.**

been so destructive to the flocks, particularly to lambs, that the farmers in the North Tyne country applied to the Board of Agriculture for advice and assistance, and Sir Stewart Stockman, Chief Veterinary Officer of the Board, recently met a representative gathering of sheep farmers and shepherds at Bellingham in Northumberland, where a conference was held to discuss the application to practice of the results of research on this disease. Sir Stewart Stockman's own inquiries into the pathology of Louping-ill were published at some length in the issue of this *Journal* for April, 1919, and he was able to give the meeting an assurance that the farmers have the remedy in their own hands provided it suits their business to adopt it. By taking the proper measures they can clean up thousands of acres of infected pastures. The investigations show that Louping-ill is a tick-born disease. The ticks feed on blood of an infected sheep and afterwards pass infection on to the other sheep upon which they feed. The obvious method of eradicating the disease is to free the pastures of the ticks by stocking each part of the pasture heavily in turn with sheep to catch the ticks, and then dipping the sheep in an anti-tick bath. The ticks attack the sheep in order to feed on their blood and remain attached to their bodies for about five days; dipping with intervals of five days will, therefore, catch the greatest number of ticks on the sheep. Another method to be used in conjunction with the dipping is to drive the sheep from tick-infested

* See this *Journal*, June, 1919, p. 339.

pastures into a pen littered with damaged straw or other rubbish of a combustible kind. Once in the pen the sheep are driven round, and this disturbance shakes the gorged ticks on to the straw. After a time the sheep are driven out of the pens, and the straw or whatever other litter is employed is burnt, the ticks being destroyed with it. By the adoption of these methods it is believed that tick-infected pastures can be gradually cleaned, and the costly mortality among the flocks very greatly reduced and in time even eradicated. Experiments are to be conducted with a serum which will be injected into sheep suffering from Louping-ill, and it is hoped that this remedy may prove effective in decreasing losses during eradication, but eradication should be the main object. Farmers and shepherds in Northumberland are anxious to adopt any measures that may be either preventive or curative, and Sir Stewart Stockman has agreed to advise upon and supervise any operations for the eradication of Louping-ill which farmers may undertake.

FOR some time past certain mischievous rumours have been circulating in England and Scotland, particularly in Scotland, with reference to the Board of Agriculture's Testing Station at Pirbright in Surrey. It is difficult to overtake rumour, but it is desirable that in the present case the rumours should as far as possible be met. The result of misleading statements are on occasion of quite another kind to that which was intended by the originator. The following letter has been received by the Board from a prominent cattle breeder of Scotland:—

**The Pirbright Cattle
Testing Station:
Mischievous Rumours
denied.**

"I had to be in London last week and went out to Pirbright. I am glad I went. I was anxious to see the conditions under which the animals are kept, and I shall now be able to refute entirely the mischievous reports, born of ignorance and prejudice, that are circulating among cattle dealers in England and Scotland. In my opinion the animals at Pirbright are being kept under ideal conditions, and I was more than pleased with everything I saw, so far as the condition of the animals is concerned. I think the Board have an exceedingly capable veterinary inspector and I shall have no hesitation in sending further animals to be tested.

"Of course, in Scotland, as you will entirely understand, we would much prefer to avoid the expense of sending animals to Surrey and be put to the further expense of bringing back any which may unfortunately react. There is a further difficulty that breeders may object to take back animals which have been in the south of England in a district not far removed from cases of Foot-and-Mouth Disease. I have had occasion to be in Berkshire, Herefordshire, Shropshire and Cumberland since my visit to Pirbright, and while looking for animals for export I took the opportunity of disabusing the minds of breeders of the prevailing notion that their animals might get mixed up with others at Pirbright and run the risk of contamination. I assured them that every animal is absolutely isolated and that every care and attention are given to them."

The Board have received this letter with the greatest pleasure, because it supplies much needed information and correction to those who have confused rumour with truth.

ALL who have lately acquired agricultural estates, and farmers who have recently come into possession of their farms, will doubtless be a little puzzled to find a half-yearly or

How to Redeem Tithe. yearly summons to pay tithe. There is no reason to doubt that many owners of land would prefer to rid themselves of the liability. Thanks to the Tithe Act of 1918 this is readily done, and at a reasonable cost; indeed, during the past twelve months applications for redemption of tithe rent-charge amounting to £21,513, and to capital values of about £300,000, have reached the Board. Although the tithe included in these applications must be regarded as considerable, being, for example, nearly eleven times as much as that in the applications received during the pre-war year, 1913, the Tithe Act of 1918 has not completely fulfilled the hopes of some of its supporters. Applications would undoubtedly have been larger but for the widespread belief that redemption proceedings involved landowners in a considerable amount of trouble. Nothing more, however, is required in the great majority of cases than that the applicant should write to the Board of Agriculture, giving particulars of the tithe rent-charge he wishes to redeem, together with the names and addresses of the owner and collector of the charge. All other work falls upon officers of the Board.

It is of interest to note that at the moment, where tithe rent-charge is payable to the incumbent in right of his benefice, the cost of redemption is about 17 years' purchase of the present annual value. Where tithe rent-charge is otherwise held, the consideration is about $15\frac{1}{2}$ years' purchase. Persons who cannot supply correct particulars of the tithe rent-charge should send to the Board a plan of their property, preferably on a 1/2,500 scale Ordnance sheet, with boundaries of the land to be redeemed clearly and accurately set out with a coloured edging. If any further particulars are desired, they can be obtained, together with the necessary forms of application, free of all charge, on application to the Board.

It is generally admitted that the common lands in England and Wales are not only important as means of livelihood for small holders and others who live upon their boundaries, but also as a source of fresh air and recreation to town dwellers. From time to time, however, the Board receive complaints as to encroachments or illegal inclosures of common

Common Lands and How to Protect them.

land which are gradually reducing the area of the common lands in this country. In this connection it may be useful to note that Section 30 of the Commons Act, 1876, provides that a County Court within whose jurisdiction any common or part thereof is situate may grant an injunction against or make an order for the removal or abatement of such inclosure or encroachment. Under Section 26 (2) of the Local Government Act, 1894, a District Council may in certain circumstances aid persons in maintaining rights of common. As a rule, however, the most effective method of putting a stop to encroachments on a common is by means of a scheme made by the Urban or Rural District Council with the approval of the Board under the Commons Act, 1899, for the regulation and management of the common. The necessary forms and regulations under the Act may be obtained from the Board post free on application.

! LORD IVEAGH, who has done so much for deserving causes, is anxious to help those sons of agricultural labourers who are bright, intelligent and fit for more responsible work than that

**A Farm School for
Suffolk: Gift from
Lord Iveagh.**

which would fall to their lot in ordinary circumstances, but are barred from advancement by lack of education. To this end he has purchased the Chadacre Hall Estate of some 500 acres in the County of Suffolk, and is prepared to defray the whole cost of establishing a Farm Institute for 40 or or 50 boys who will be admitted at the age of 16 years, after [some training on a farm. The Institute is intended primarily for the sons of poor parents, particularly of farm labourers, but sons of small farmers and small holders will be considered, together with cases recommended to the Governing Committee by Local Authorities, school managers, clergy and others. Lord Iveagh hopes that it will be possible for the Farm Institute to begin work at Michaelmas. No fees are to be charged, board, lodging and instruction being entirely free. Lord Iveagh's action will meet a need that some of those interested in agriculture have long recognised. There are many farm lads who need no more than the stimulus of sound training to enable them to take a prominent part in agricultural work, administrative as well as practical. The hope may be expressed that others who have the best interests of agricultural England at heart will emulate the good work of Lord Iveagh.

In the Report of the Government Chemist upon the work of the Government Laboratory for the year ended 31st March, 1919,* it is stated that the number of samples examined for the Board of Agriculture and Fisheries, the Board of Agriculture for Scotland and the Department of Agriculture and Technical Instruction for Ireland was 581, as compared

**Report of the Work
of the Government
Laboratory, 1918-1919.**

with 1,568 in the previous year.

Sheep Dips.—Twenty-six samples of sheep dips were received for examination in connection with applications by manufacturers for inclusion of their preparations in the official "Schedule of efficient dips." Before the Board give their approval to any dip they must be satisfied that the formula provides for a sufficient quantity of a recognised active ingredient and that the dip has been made in accordance with the formula. In 15 cases the samples were found to agree with the formula, and were of effective strength at the proposed dilution; six were deficient in active ingredients at the dilution submitted by the makers; in the remaining five cases the formulæ required modification to ensure an efficient dip. Four samples of approved dips obtained in different parts of the country were also examined with the object of ascertaining whether the dips as sold or used correspond in composition with the samples which had received the Board's approval. The analyses showed that one of these had not been prepared according to the formulæ previously submitted and approved.

The miscellaneous samples examined for the Board included samples for the Food Production Department, waste materials, as to their value as fertilisers; cattle feeding stuffs; basic slag; potash materials; seeds; insecticides and manures.

* Cmd. 419. 1919. Obtainable from H.M. Stationery Office, Imperial House, Kingsway, London, W.C.2, price 2d. net.

Questions submitted by the Board for Report.—It is stated that in the course of the year numerous matters were submitted by the Board for report. Many of these related to the value of materials supplied as feeding stuffs, and to the supply of potash and phosphatic manures. The official method for the determination of potash in fertilisers has been revised and a new method drawn up for use in the case of flue dust (F. & F. Stuffs (methods of analysis) Regulations No. 659, 1918).

Flax Retting.—A number of samples of water proposed to be used for retting flax were analysed.

Fertilisers and Feeding Stuffs Act.—The samples under this Act were submitted by the Board in connection with applications by local authorities for the consent of the Board to proceedings against the sellers. The number of samples received was 11, consisting of 5 fertilisers and 6 feeding stuffs, as against 20 in the previous year.

The fertilisers consisted of superphosphate, basic slag and sulphate of ammonia.

The feeding stuffs examined consisted of feeding meals and cakes, milling by-products and poultry foods. Several of the meals contained a considerable proportion of substances unsuitable for feeding purposes.

SINCE the date of the list given on pp. 345-6-7 of the issue of this *Journal* for June last, the following leaflets have been issued in the

Permanent Series :—

**Leaflets Issued by
the Ministry.**

No. 330.—*Apple Aphides.*

„ 331.—*Canning of Fruit and Vegetables.*

(Previously issued as F.P. Leaflet No. 34).

No. 332.—*Liquid Manure.*

„ 333.—*Fish Meal as a Food for Live Stock.*

In addition, the information in the following *Leaflets* has been revised and brought up to date :—

No. 26.—*Tenant Farmers, Income Tax, and Accounts.*

„ 100.—*The Breeding and Management of Pigs.*

„ 137.—*Potato Scab.*

„ 105.—*Wart Disease.*

„ 141.—*The Preparation of Honey for Market.*

„ 153.—*Storing of Turnips and Mangolds.*

„ 162.—*Propagating Apples, Pears, Plums and Cherries.*

„ 167.—*Ducks and Duck-breeding.*

„ 178.—*Onion Mildew.*

„ 180.—*Dodder.*

„ 197.—*Agricultural Education and Research in England and Wales.*

„ 198.—*Rearing and Marketing of Geese.*

„ 207.—*Strawberry Cultivation.*

„ 235.—*Organisation of the Milk Supply.*

„ 244.—*The Destruction of Rats.*

„ 253.—*Microsporidiosis of Bees, or Isle of Wight Bee Disease.*

„ 290.—*The Cattle Testing Station of the Board of Agriculture and Fisheries.*

„ 297.—*Seed Testing.*

„ 298.—*Pig-keeping for Cottagers and Smallholders.*

„ 309.—*Suggestions to Allotment Holders for Autumn Treatment of Land.*

„ 317.—*The Rearing of Chickens.*

No. 321.—*Notes on Essential Points in Poultry Keeping.*

„ 323.—*The Profitable Utilisation of Surplus Milk.*

Food Production Leaflet No. 59.—Economy in the Use of Hay.

The following *Permanent Leaflets* have been withdrawn from circulation :—

No. 76.—*Cucumber and Melon Leaf Blotch.*

„ 87.—*A Fungus Disease of Young Fruit Trees.*

„ 116.—*Sleepy Disease of Tomatoes.*

„ 143.—*The Turnip Mud Beetle.*

„ 144.—*Heart Rot of Beet, Mangold and Swede.*

„ 165.—*Gall Gnats injurious to Willows and Osiers.*

„ 185.—*Bean Pod Canker.*

„ 216.—*The Administration of the Small Holdings Act.*

„ 217.—*The Provision of Allotments.*

„ 271.—*Clover Sickness.*

„ 281.—*Apple Leaf-Spot.*

„ 316.—*Sorghum for Fodder.*

The following *Food Production Leaflets* have been withdrawn from circulation :—

No. 3.—*Notes on Poultry Feeding.*

„ 15.—*The Use of Sulphate of Ammonia as Manure.*

„ 18.—*Seed Testing for Farmers.* (Replaced by F.P. Leaflet No. 47).

„ 19.—*Pig Feeding in War Time.*

„ 26.—*Economy in the Use of Seed Grain.*

„ 43.—*Practical Hints on Potato Spraying.*

„ 54.—*The Cropping of Grass Land Broken up for 1918 Harvest.*

THE Government have announced the constitution of the Forestry Commission, which has been set up under the new Forestry Act. The names and qualifications of the Commissioners

are as follows :—

Forestry Commission.* Lord Lovat (*Chairman*).—Owner of extensive woodlands and closely identified with forestry in Scotland. Director of Forestry, B.E.F., France, Member of the Forestry Reconstruction Sub-Committee and of the Interim Forest Authority.

Mr. F. D. Acland, M.P.—Chairman, Home-Grown Timber Committee, Chairman of the Forestry Reconstruction Sub-Committee, Chairman of the Interim Forest Authority.

Lord Clinton—Former President of the English Forestry Association. Member of the Interim Forest Authority

Mr. L. Forestier-Walker, M.P.—Will answer for the Commission in the House of Commons. Will represent Wales.

Sir John Stirling Maxwell.—Assistant Controller (Scotland), Timber Supply Department, Board of Trade. Honorary Secretary, former President, Royal Scottish Agricultural Society, Member of Forestry Sub-Committee. Will represent Scotland.

Mr. T. B. Ponsonby.—Member of the Interim Forest Authority. Identified with forestry in Ireland. Will represent Ireland.

Mr. R. L. Robinson.—Member of the Interim Forest Authority, Secretary, Forestry Reconstruction Sub-Committee. Formerly

* This Notice was omitted from last month's *Journal* owing to want of space.

head of Joint Forestry Branches of the Board of Agriculture and Office of Woods. Distinguished career at Adelaide and Oxford Universities in pure science and forestry.

Colonel W. T. Steuart-Fotheringham.—Member of the Interim Forest Authority. Assistant to Assistant Controller (Scotland), Timber Supply Department. Identified with forestry development in Scotland. Will represent Scotland.

THE following Circular Letter (No. 64,956/H) was addressed to the Councils of Boroughs (including Metropolitan Boroughs) and Urban and Rural Districts in England and Wales by

By-laws affecting the the Board on 18th November :—

**Breeding of Pigs
and Poultry.***

SIR,—I am directed by the President of the Board of Agriculture and Fisheries to refer to the Circular Letter which was issued by the Local Government Board on 28th May, 1918,† suggesting that Local Authorities should give encouragement in the keeping of pigs by not enforcing by-laws against such pig-keeping, provided that the interests of public health were not seriously jeopardised, and to say that the Board of Agriculture are receiving complaints from persons who have undertaken the keeping of pigs and poultry that they have been informed that in future the by-laws will be strictly enforced.

I am to point out that the Board of Agriculture are very strongly of opinion that the necessity for encouraging the keeping of pigs and also of poultry is still very great, and will continue to be so for the next few years, and under these circumstances I am to express the hope that your Local Authority will give all possible facilities consistent with the maintenance of public health for the keeping of pigs and poultry, and to that end, and, wherever local circumstances will allow, refrain from enforcing by-laws prohibitive of the keeping of such live stock.

I am, etc.,

(Signed) A. D. HALL,

Secretary.

THE Board desire to give notice of the publication of the eighth volume of the Special Reports on the Mineral Resources of Great Britain, which have been prepared by the Director of

Special Reports on the Geological Survey in response to numerous
the Mineral Resources inquiries that have arisen through the con-
of Great Britain. ditions brought about by the late War.
Price 9s. net.

This volume, which is one of a series of six dealing with the subject of the iron ores of Great Britain, gives a general account of the geology of the hæmatite occurrences in West Cumberland, Lancashire and the Lake District, the nature of the ore bodies and the history of the development of the workings. The varieties and constitution of the ores are given in detail, with many analyses. Modern methods of mining are described and statistics of output and estimated reserves are given. The volume concludes with a detailed account of each mine.

Copies may be obtained through any bookseller from the Director-General, Ordnance Survey Office, Southampton.

* This Notice was omitted from last month's *Journal* owing to want of space.

† Not printed in this *Journal*.

THE Ministry of Food issued the following announcement to the Press on 9th January :—

De-Control of Dairy Produce.

The Food Controller, with the concurrence of the Minister of Agriculture and Fisheries and the Secretary for Scotland, has decided to discontinue, as from 31st January, various measures of control at present exercised over milk products.

Milk.—The Milk (Winter Prices) Order, 1919,* will be revoked as far as it pertains to prices, and thereafter milk may be bought or sold, whether by wholesale or retail, free from the restrictions on price imposed by the Order. Prices will be determined in the normal way by the free operation of supply and demand. The clauses (10), (11), (12), prohibiting the addition to milk of colouring matter or water, the reconstitution of milk, the use, without authority, of bottles or cans belonging to other persons, and the clauses (14) and (15) giving power to Food Committees, subject to the consent of the Food Controller, to buy and sell milk, to make arrangements for its distribution and to give directions for securing the purity and cleanliness and wholesomeness of milk, will remain in force. No alteration will be made in the Milk (Registration of Dealers) Order, 1918,† which prohibits retailers and wholesalers of milk carrying on business without a licence, but the retention of this Order will not interfere with the formation of co-operative depots under proper supervision. An Order will be issued, to take effect on 1st February, prohibiting the use of the terms "Grade A" or "Grade B" in connection with the sale of milk, except under licence by the Ministry of Food.

Cheese.—Home-produced cheese manufactured after 31st January, 1920, will not be purchased by the Ministry for the Pool, but will be free to find its natural market without restriction of price. The Ministry is purchasing hard home cheese, made during the month of January, 1920, and delivered to the Pool on or before February 29th, 1920, under the same terms and conditions as were in force in respect of the December make of such cheese.‡ The Ministry will continue to distribute the home cheese so purchased through the Home Cheese Distribution Scheme at controlled prices until further order.

Butter.—Home-produced butter will, as from 31st January, 1920, be freed from the existing control over prices, but the Ministry will continue to provide, through the Butter Distribution Scheme, the guaranteed ration of Government butter, *i.e.*, butter purchased and imported by the Ministry of Food, at a controlled retail price to all persons who have registered their ration card with a retailer of Government butter. Supplies of Government butter will also be continued to establishments under the existing procedure.

Cream.—The Cream Order, 1918, will be revoked as from 31st January, 1920, after which date cream may be made, sold, and purchased free from any restrictions.

Condensed Milk.—The maximum retail prices of condensed milk will be suspended as from 31st January, 1920.

In giving effect to these decisions the Food Controller must, of course, retain power in case of emergency to deal with any unforeseen difficulties which may arise.

* See this *Journal*, September, 1919, p. 650.

† " " " April, 1918, p. 110.

‡ " " below.

THE Food Controller has issued a Notice under the British Cheese Order, 1917, fixing the maximum first-hand prices for the varieties of home cheese (except Caerphilly, Ripened Stilton, and Wensleydale Blue Cheese) manufactured during the month of January, 1920, and delivered up to and including 29th

February, 1920. The prices are the same as those previously announced for cheese manufactured between 1st November and 31st December, 1919 (inclusive), in Great Britain, and Ireland, and delivered on or before 31st January, 1920, and published in the Note on p. 937 of last month's issue of this *Journal*. The Notice also provides that the maximum first-hand prices for cheese manufactured up to and including 31st December, 1919, (except in the case of Ripened Stilton and Wensleydale Blue Cheese which have been freed from the Order) apply to such cheese delivered up to and including 29th February, 1920, instead of 31st January, 1920, as previously stated.

THE following Memorandum was addressed to the London County Council and the Councils of Boroughs and Urban Districts in England and Wales by the Board on 1st January:—

Withdrawal of Allotments for Use for Building Purposes.

1. The Board consider it desirable to call the attention of Councils to the procedure which should be adopted as regards land entered on for allotments, under the Cultivation of Lands Orders, made under the Defence of the Realm Regulations, that is required for building.

2. As stated in the second paragraph of the Board's Circular Letter of the 23rd May last (C. L. 158/C. 6)* the Board consider that while the retention of land as allotments cannot be permitted to restrict the development of a town, or to prevent the erection of houses, factories, etc., no land cultivated as allotments should, as a general rule, be voluntarily given up for building purposes until shortly before the owner is in a position to commence building operations. In such cases Authorities should, therefore, satisfy themselves that the plans of buildings have been approved by the Local Authority, and that the building material is available to commence work.

3. Where a Council receive an application for land to be given up for building, they should first satisfy themselves, in accordance with the procedure outlined in the foregoing paragraph, that the case is one in which the Council should comply with the owner's request. They should then ascertain definitely from the owner the date on which he is in a position to start building in order that as long a notice may be given forthwith to the allotment holders, so that they may arrange to harvest any crops on the ground. While the Council should arrange to give as long a period of notice as possible to the allotment holders, they should fix a date for giving up possession so long ahead as to prevent the builder utilising the men and materials he may have ready for building on the site on the particular date named by him or the owner.

4. Cases have recently occurred where land has been required for building, and, owing to the long period of notice given by the Local Authority to the allotment holders, or even without any such excuse, the owner or builder has entered on the land, for the purpose of building, on a date prior to the date of the termination of the notices which have

* See this *Journal*, June, 1919, p. 333.

been given by the Local Authority to the allotment holders. The procedure outlined in paragraph 3 of this Memorandum should, therefore, be followed in future, and your Council should take steps to bring publicly to the notice of owners of land the fact that any unauthorised entry on land before the Council have withdrawn is an offence against the Defence of the Realm Regulations, and is punishable by a fine of £100, or six months' imprisonment, or both, and that if any cases arises in which an owner has wilfully entered on land without authority, your Council will not hesitate to obtain the necessary authority to institute legal proceedings against him.

5. **Compensation to Allotment Holders on Dispossession.**—The Board have obtained from the Treasury authority to pay, when necessary, as an act of grace, compensation to allotment holders dispossessed of their holdings within a period of two years after the termination of the War. This applies only to allotment holders on land entered upon by a Local Authority under the powers conferred on them by the Cultivation of Lands Orders, made under the Defence of the Realm Regulations. The compensation payable will be restricted to the value of the growing crops, and the labour expended and manure applied with a view to a future crop before the allotment holder received notice.

6. Local Authorities are urged to arrange, as far as possible, that

(a) where land is required for building or other industrial purposes, or

(b) where the compensation payable for continued possession of the land would be in excess of the value to the nation of the food produced,

the land should be given up at a time when there are few crops on the land, and that in any case in which there is a definite prospect of land being required for building next spring or summer, allotment holders should be warned not to plant crops or expend labour, or apply manure to crops which cannot be harvested before the date when the land will have to be given up.

THE following Circular Letter was addressed to Local Authorities in Great Britain under the Diseases of Animals Acts, 1894, to 1914, by the Board on 30th December :—

Double Dipping of Sheep.

SIR,—I am directed by the Board of Agriculture and Fisheries to refer to their Circular Letter to Local Authorities dated the 16th March, 1917 (A 303/C.),* relative to the question of the double dipping of sheep, and to say that the attention of the Board has been called from time to time to the fact that in some cases injury and sometimes deaths have resulted amongst sheep which have been dipped at intervals of less than 14 days. Inquiry in the matter has in every case elicited the fact that the sheep which had suffered had been dipped in poisonous dip on each occasion.

It is recognised that if a poisonous dip is used there is a risk of poisoning from bad handling of the sheep when dipping, and also from the sheep before they are properly drained being placed on confined pasture, and so poisoned from eating herbage which is contaminated by the draining from the sheep, and also by rain washing the poison out from the wool.

* Not printed in this *Journal*.

It has been proved that double dipping with an interval of not more than 14 days between the dippings is a necessary measure to secure the eradication of Sheep Scab, and that when proper precautions are taken such dipping can be carried out with little risk even when poisonous dips are used for each dipping. All risk, however, can be avoided by the use of non-poisonous dips, of which the lime and sulphur dip (see footnote as to Ingredients, etc.), is considered the best for the cure of Scab.

I am, therefore, to suggest to your Local Authority that when double dipping with an interval of not more than 14 days between the two dippings is prescribed, either by an Order of the Board or by a Notice issued under any Order of the Board, the owner or owners concerned should be warned that it is always safer to use non-poisonous dips, and if they elect to use a poisonous dip for the purposes of the first dipping it is highly advisable that for the purposes of the second dipping a non-poisonous dip should be used. There are, of course, many non-poisonous dips on the market which have been approved by the Board for the purposes of their Orders relating to Sheep Scab and Sheep Dipping.

I am, etc.,

(Signed) A. D. HALL.

Prescription for Lime and Sulphur Dip.

Ingredients.—Lime, powdered sulphur and water in the proportions indicated above.

A convenient quantity for a large establishment to make up at a time would be 9 lb. lime and 18 lb. sulphur.

Method of Preparation.—Slake the lime and make into a thick paste with the sulphur. Place the mixture in a strong cloth, tie the ends and suspend in a boiler containing 10 gal. of water so that the water completely covers the contents of the cloth. The cloth must not touch the sides or bottom of the boiler, as otherwise the cloth may be burned and its contents escape. Boil for two hours, then remove the cloth, taking care that none of its contents escape into the water, and throw the solids away. Make up to 10 gal. again with additional water, and put the liquid into a tight drum or barrel. This quantity is sufficient when mixed with water to make 100 gal. of dipping bath. The period of immersion in this dip should not be less than half a minute.

SINCE the Note was published in the issue of this *Journal* for last month, summarising the position as regards Foot-and-Mouth Disease in Great Britain, all the remaining general restrictions have been withdrawn from the Surrey and ten Isle of Wight Scheduled Districts, no outbreaks of the disease having

Foot-and-Mouth Disease.

occurred therein since 12th and 24th November respectively. In Warwickshire a small area still remains subject to a Prohibition Movement Order on account of the outbreak of the disease near Rugby on 15th December. Outbreaks have unfortunately appeared in six fresh centres during the past four weeks, and the position as regards each centre, and of the Durham outbreak notified last month, is as follows:—

Durham.—Further outbreaks on premises about 5 miles from the original centre were confirmed on 3rd January at Sherburn Hill and Shadforth, and on 7th January at Shadforth. These three cases were connected. The restrictions on movement and marketing of stock have been modified as regards a large part of the Scheduled District, but no movement out of the district is permitted.

West Sussex.—An outbreak was confirmed at Harting on 22nd September, and the usual Order entirely prohibiting movement within a radius of about 15 miles was made. There has fortunately been no extension of the disease in this locality, and the general restrictions have been modified.

Yorkshire (West Riding) (Sheffield District).—An outbreak was confirmed at Bradfield on 23rd December, and an Order was at once made prohibiting movement in a large area around the Infected Place. There has been no further case and the restrictions have been modified.

East Kent.—An outbreak was confirmed at Alkham, near Dover, on 27th December, and another at Cheriton, Folkestone, on 28th December. Since the later date five further outbreaks have been confirmed in the same locality, the latest being on 10th January. Prohibition of movement of animals is being maintained in a substantial area around Dover and Folkestone, but the restrictions have been modified as regards the remainder of the Scheduled District.

Hampshire, Dorset, Essex.—Outbreaks were confirmed at Boldre, near Lymington, Hampshire, on 9th January, and at West Mordan, Dorset, and Great Waltham, Essex, on 10th January. Orders were at once made prohibiting movement of animals in a large area in the localities affected.

ONLY one case of Rabies has been confirmed in Great Britain since the Note in the December issue of this *Journal* was written. This was at Hythe, Kent, on 5th January. The unmuzzling areas in (a) Monmouthshire and South Wales, and (b) North Essex and Suffolk, have been substantially reduced.

IN connection with the Royal National Eisteddfod of Wales, to be held at Barry in August, 1920, the Executive Committee announce that a competition has been arranged for the best essay on each of two subjects dealing with agriculture. The titles of the subjects, the prizes to be awarded, and the names of the adjudicators, are as follows:—

1. Account of a series of experiments on the relative values of the nitrogenous manures (in connection with other manures) for cropping in agriculture £5

Adjudicator.—Abel E. Jones, Esq., B.Sc., N.D.A., N.D.D., Aberystwyth.

2. Account of the cropping of a small holding of from 2 to 3 acres, giving the initial capital required, annual expenditure, and possible returns for the first 3 years, supposing the holding was

(a) on cultivated land. } £10
(b) on old pasture. }

Adjudicator.—George P. Berry, Esq., Horticultural Division, Ministry of Agriculture and Fisheries, London.

For further particulars as to the general rules and conditions of the competition, application should be made to Mr. D. W. Walters, B.Sc., 15, Wenvoe Terrace, Barry, Glam. An addressed envelope should be enclosed with the application.

September, 1919, p. 650.—In line 7 of the Note "Winter Milk Prices in Great Britain" the figure under "February" should read 3s. 3d. instead of 3s., and under "March" 3s.

"*Journal*" Errata. instead of 3s. 3d.

December, 1919, p. 940.—In line 26, for "Netherhampton, in Hampshire," read "Netherhampton, in Wiltshire."

NOTICES OF BOOKS.

Cottage Buildings in Cob, Pisé, Chalk and Clay.—C. Williams-Ellis (London: Offices of "Country Life," 1919, 6s. net). This book is a new and valuable addition to the "Country Life Library." Its publication indicates an increased interest in the whole question of building material. The needs of the housing problem are proving to be an incentive to research and inquiry into every method of construction. When the material used by our ancestors in the construction of their mud huts is shown to be, if scientifically used, good building material for our houses to-day, one is inclined to believe the truth of the saying that "there is no new thing under the sun."

This book should be read before walls of earth are condemned; it would then be understood that certain methods of building have been so long neglected that to inquire into and revive their use almost amount to something novel. Many of these ancient methods were thoroughly practical.

Construction in cob, chalk and clay lump has in the past been employed in countless small buildings throughout England, and the fact that such buildings are still standing four square to the winds testifies to the usefulness and the durability of the material. The book contains much valuable information and good illustrations of buildings of these materials, but the really interesting chapters are those dealing with pisé or rammed earth used for building walls. This method of building has been little employed in this country, though it has been used most successfully in parts of France and Australia. The material, being the native earth dug from the site, has the same advantage of cheapness as is possessed by the cob of Devonshire. There is no expense for purchase and transport, but it is considered superior to cob.

Mr. St. Loe Strachey has been mainly instrumental in introducing this kind of building into this country, and his enthusiasm refused to be damped by those who prophesied evil. He persisted in his experiments, and has gone far enough to prove that pisé is an eminently practical form of walling for modern-day use in small buildings. He has written a racy preface to the book telling how he came to make his experiment and what he has achieved. Mr. Williams-Ellis supplements this in the body of the book, with reports from other sources and some practical hints on the construction of the shuttering that is essential for the hard ramming of the earth, and tells us what kind of earth is required for success.

Pisé buildings would seem to go some way to solve the housing problem of the present day, at any rate for rural houses. The material offers a method of building walls without bricks and without skilled labour, sound in every sense.

The "Country Life" Book of Cottages.—Lawrence Weaver (London: Offices of "Country Life," 1919, 9s. 6d. net). This book was first published in March, 1913, and was then extensively reviewed. In this new edition many chapters have been wholly rewritten and furnished with fresh illustrations, showing the most recent types of cottages, especially those for the housing of the agricultural labourer.

National Year-book of Agricultural Legislation, 1918.—The International Institute of Agriculture has recently issued its eighth International Year-book of agricultural legislation. The volume contains an introduction in English, in which the general course of the legislation of the world in 1918 in connection with agriculture is outlined, principally as affected by the conditions created by the later phases of the War, and by the reconstruction movement which has followed.

The price of the volume is 11s. 11d. Remittances should be forwarded to the Secretary, Board of Agriculture and Fisheries, 3, St. James's Square, London, S.W. 1.

MISCELLANEOUS NOTES.

THE *International Crop Report and Agricultural Statistics* for December, 1919, published by the International Institute of Agriculture, gives particulars concerning the production of the cereal crops of 1919 in certain countries in the Northern Hemisphere.

Notes on Crop Prospects and Live Stock Abroad.

Wheat.—The production in Denmark, Spain, France, Great Britain, Italy, Netherlands, Rumania, Switzerland, Canada, United States, British India, Japan, Algeria, and Tunis is estimated at 259,270,000 qr. in 1919, against 279,700,000 qr. in 1918, or a decrease of 7·3 per cent., the area sown showing an increase of 0·5 per cent.

Rye.—The estimated production in Denmark, Spain, France, Italy, Netherlands, Rumania, Switzerland, Canada, and the United States is placed at 22,056,000 qr. in 1919, or a decrease of 1·2 per cent. compared with 1918, when it amounted to 22,334,000 qr., but the area sown shows an increase of 6·9 per cent.

Barley.—The production in Denmark, Spain, France, Great Britain, Italy, Netherlands, Rumania, Switzerland, Canada, United States, Japan, Algeria, and Tunis is estimated to amount to 72,044,000 qr. in 1919, against 84,620,000 qr. in 1918, or a decrease of 14·9 per cent., the area sown being smaller by 6·0 per cent.

Oats.—It is estimated that the total yield in Denmark, Spain, France, Great Britain, Italy, Netherlands, Rumania, Switzerland, Canada, United States, Japan, Algeria, and Tunis amounts to 221,626,000 qr. in 1919, against 261,632,000 qr. in 1918, or a decrease of 15·3 per cent., the area sown being smaller by 1·9 per cent.

Maize.—The production in Spain, Italy, Rumania, Switzerland, Canada, and the United States is estimated at 364,817,000 qr. in 1919, against 317,614,000 qr. in 1918, or an increase of 14·9 per cent., while the area sown shows a decrease of 3·3 per cent.

Finland.—H.M. Minister at Helsingfors reports that the production of cereals in Finland, in 1919, is estimated by the Finnish Board of Agriculture as follows:—Rye, 1,454,000 qr.; barley, 743,000 qr.; and oats, 3,031,000 qr. The quantities required for consumption in Finland are estimated to be:—Rye, 2,827,000 qr.; barley, 531,000 qr.; and oats, 2,538,000 qr.

New Zealand.—The area under wheat this year in New Zealand is officially estimated at 142,000 acres, compared with 210,000 acres seeded last year. The area under oats is estimated at 410,000 acres, against 487,000 acres last year. (*Broomhall's Corn Trade News*, 31st December, 1919.)

Live Stock in Canada.—The numbers of live stock in 1919 were as follows (the corresponding numbers in 1918 being shown in brackets) :—Horses, 3,667,369 (3,609,257); dairy cows, 3,547,437 (3,543,600); other cattle, 6,536,574 (6,507,267); sheep, 3,421,958 (3,052,748); pigs, 4,040,070 (4,289,682). (*International Crop Report and Agricultural Statistics*, December, 1919.)

THE monthly crop report of the Board on 1st January was as follows:—The weather of December was everywhere mild and wet, with the result that little progress with the further seeding of the land could, as a rule, be made. As the preceding months

**Agricultural
Conditions in England
and Wales
on 1st January.**

had been favourable to cultivation, however, work is practically everywhere forward for the time of year. The young crops, where showing, are generally satisfactory, with the exception of some wheat on low-lying land, which has suffered a little from the wet. As compared with the same period a year ago, it is estimated that the area at present sown with wheat is slightly smaller; while it is reckoned that one-fifth of the ultimate wheat area yet remains to be seeded.

In nearly all districts many fields of seeds are patchy and thin, but reports of even and promising plants are more common, and on the whole the position is fairly satisfactory, an improvement being very generally reported.

Turnips and swedes, though a small crop, are generally sound and of good quality.

The condition of ewes is fairly satisfactory; and lambing prospects in the earliest districts are regarded as favourable. Owing to the scarcity of winter keep, especially hay and roots, stock are being fed more sparingly than usual, and in many districts are somewhat lean in consequence. Many cattle are still out at grass.

Unskilled labour is generally sufficient, but skilled men on the other hand are scarce in all districts.

The following local summaries give details regarding agricultural labour in the different districts of England and Wales in December:—

Agricultural Labour in England and Wales during December. *Northumberland, Durham, Cumberland, and Westmorland.*—The supply of labour is now sufficient as a rule, though in one or two districts there is not enough temporary labour for turnip-lifting, and skilled labour is occasionally scarce.

Lancashire and Cheshire.—The supply of labour is sufficient in most districts, but in some there is a scarcity of skilled men.

Yorkshire.—The supply of labour is sufficient, but skilled men are still scarce.

Shropshire and Stafford.—The supply of labour is, in general, adequate, but in many districts more skilled men are needed.

Derby, Nottingham, Leicester, and Rutland.—In most districts there is a shortage of experienced and skilled men; the supply of unskilled labour appears to be sufficient.

Lincoln and Norfolk.—The supply of ordinary labour is about sufficient, but there are still complaints of a shortage of skilled men, such as horsemen and cattlemen.

Suffolk, Cambridge, and Huntingdon.—As a rule the supply of labour is sufficient, but in many parts of Cambridge and Huntingdon skilled men are wanted.

¶ *Bedford, Northampton, and Warwick.*—Though skilled men are scarce, there is sufficient labour available.

Buckingham, Oxford, and Berkshire.—The supply of labour is sufficient to meet present requirements, but skilled men are still in demand.

Worcester, Hereford, and Gloucester.—There is sufficient labour available, though skilled men are scarce in some districts.

Cornwall, Devon, and Somerset.—The supply of labour is sufficient for present requirements, as a rule, but there are local shortages of skilled men.

Dorset, Wiltshire, and Hampshire.—The supply of labour is generally quite sufficient for this season of the year. Unskilled labour is abundant, but there is a shortage of skilled thatchers, hedgers, and ditchers.

Surrey, Kent, and Sussex.—The supply of labour is, as a rule, sufficient, but in many districts more skilled men are wanted.

Essex, Hertford, and Middlesex.—The supply of labour is sufficient generally, but in Essex skilled men are still needed.

North Wales.—The supply of labour is, as a rule, sufficient, but there is still a demand for skilled men in some districts.

¶ *Mid Wales.*—The supply of labour is now sufficient for requirements in most districts.

South Wales.—The supply of labour is, on the whole, adequate, though there are still local shortages, especially of skilled men.

SEPTENNIAL, QUARTERLY AND ANNUAL CORN RETURNS.

STATEMENT showing what has been, during seven years, ending Christmas Day, 1919, the average price of an Imperial bushel of British wheat, barley, and oats, computed from the weekly averages of Corn Returns, pursuant to the Corn Returns Act, 1882.

Wheat.	Barley.	Oats.
s. d. 7 1½	s. d. 6 1½	s. d. 4 6½

Board of Agriculture and Fisheries,

5th January, 1920.

R. J. THOMPSON.

NOTE.—The value of £100 Tithe Rent-charge for the year 1920, as fixed by the Tithe Act, 1918, will be £109 3s. 11d.

STATEMENT showing the average price of British corn, per quarter (Imperial measure) for the quarter ending Christmas, 1919, pursuant to the Corn Returns Act, 1882.

Wheat.	Barley.	Oats.
s. d. 72 8	s. d. 101 2	s. d. 56 7

Board of Agriculture and Fisheries,

5th January, 1920.

R. J. THOMPSON

STATEMENT showing the average price of an Imperial bushel of British corn, for the year ending Christmas, 1919, pursuant to the Corn Returns Act, 1882.

Wheat.	Barley.	Oats.
s. d. 9 1½	s. d. 9 5½	s. d. 6 6½

Board of Agriculture and Fisheries,

5th January, 1920.

R. J. THOMPSON.

COMPARATIVE STATEMENT, for the years 1913 to 1919, of the quantities sold and the average prices per quarter (Imperial measure) of British corn as returned under the Corn Returns Act, 1882.

Year.	Quantities sold.			Average Price.		
	Wheat.	Barley.	Oats.	Wheat.	Barley.	Oats.
	Qr.	Qr.	Qr.	s. d.	s. d.	s. d.
1913	2,511,297	2,948,930	639,298	31 8	27 3	19 1
1914	3,027,976	3,403,072	1,164,361	34 11	27 2	20 11
1915	3,225,198	2,552,128	1,181,480	52 10	37 4	30 2
1916	3,600,391	2,182,218	1,129,096	58 5	53 6	33 5
1917	2,386,196	2,416,966	823,072	75 9	64 9	49 10
1918	2,484,210	1,870,761	448,313	72 10	59 0	49 4
1919	3,045,129	3,112,858	675,998	72 11	75 9	52 5

Board of Agriculture and Fisheries,

5th, January, 1920.

R. J. THOMPSON.

AVERAGE PRICES of **British Wheat, Barley, and Oats** at certain Markets during the Month of December, 1917, 1918, and 1919.

	WHEAT.			BARLEY.			OATS.		
	1917.	1918.	1919.	1917.	1918.	1919.	1917.	1918.	1919.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
London ...	72 1	73 1	72 10	59 0	63 2	109 2	47 2	64 6	61 11
Norwich ...	70 10	72 5	72 6	57 9	62 10	108 1	43 0	58 9	58 9
Peterborough	70 9	72 1	72 6	58 7	62 4	102 5	42 4	46 1	58 11
Lincoln ...	70 10	72 0	72 3	58 5	62 4	107 5	43 0	56 8	58 10
Doncaster ...	70 11	71 11	72 8	58 3	60 9	104 7	41 9	—	57 4
Salisbury ...	70 2	71 10	72 2	58 10	62 10	103 11	41 10	51 7	54 7

AVERAGE PRICES of **British Corn** per Quarter of 8 Imperial Bushels, computed from the Returns received under the Corn Returns Act, 1882, in each Week in 1917, 1918 and 1919.

Weeks ended (in 1919).	WHEAT.			BARLEY.			OATS.		
	1917.	1918.	1919.	1917.	1918.	1919.	1917.	1918.	1919.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
Jan. 4...	76 0	71 2	72 2	66 4	58 0	62 3	47 1	45 5	48 8
" 11...	75 8	71 2	72 6	65 7	58 2	62 5	47 2	46 9	49 8
" 18...	75 8	71 3	72 7	64 9	58 1	62 3	47 4	47 9	50 0
" 25...	75 10	71 1	72 7	64 5	58 7	61 10	47 8	48 2	49 6
Feb. 1...	75 10	71 2	72 8	64 0	58 10	62 4	47 3	50 2	49 7
" 8...	76 0	72 0	72 7	63 5	59 0	62 3	46 11	50 6	49 2
" 15...	76 3	72 3	72 8	63 8	58 11	62 5	47 3	52 0	49 0
" 22...	76 9	72 2	72 8	63 9	58 9	62 6	47 8	52 3	49 4
Mar. 1...	77 4	72 2	72 7	64 0	57 9	62 7	48 0	52 0	48 8
" 8...	78 0	72 3	72 6	63 7	58 5	62 7	48 7	52 2	48 6
" 15...	78 10	72 4	72 5	64 1	56 10	62 5	49 4	51 0	46 8
" 22...	80 3	72 3	72 7	65 6	56 9	62 1	50 4	50 3	46 4
" 29...	81 5	72 4	72 7	71 10	56 7	62 8	51 10	48 10	46 11
Apr. 5...	84 4	72 11	72 6	69 11	56 7	62 8	55 1	49 10	47 2
" 12...	85 2	73 3	73 0	71 10	56 6	62 9	57 2	47 12	47 1
" 19...	84 10	73 3	73 1	70 6	56 6	62 9	59 8	47 0	47 3
" 26...	81 1	73 3	73 1	69 5	56 10	62 9	58 6	46 8	48 1
May 3...	77 7	73 5	73 2	64 4	56 5	62 8	54 9	47 4	48 7
" 10...	78 0	73 5	73 2	64 11	56 6	63 1	55 2	47 6	47 5
" 17...	77 11	73 4	73 3	64 10	56 6	62 4	55 2	46 4	47 11
" 24...	78 0	73 3	73 2	64 9	56 6	62 7	54 11	47 8	47 11
" 31...	78 0	73 8	73 3	65 11	60 0	62 7	54 11	44 9	48 3
June 7...	78 0	73 11	73 2	67 7	59 2	62 6	55 0	45 5	47 10
" 14...	78 2	74 3	73 3	75 6	57 9	62 8	55 1	45 7	48 11
" 21...	78 1	74 4	73 3	75 0	58 5	62 8	55 2	47 8	48 7
" 28...	78 3	74 4	73 3	73 11	57 10	63 4	55 1	46 4	49 1
July 5...	78 1	74 4	73 4	69 5	61 7	62 4	55 2	46 10	49 0
" 12...	78 2	74 4	73 3	70 10	57 5	63 1	55 1	47 0	49 11
" 19...	78 3	74 3	73 4	72 1	60 5	62 9	55 2	45 4	49 11
" 26...	78 3	74 3	73 4	65 7	56 11	63 4	55 2	46 2	48 11
Aug. 2...	78 2	74 3	73 3	73 6	57 1	62 10	55 0	45 10	50 3
" 9...	78 4	74 7	73 4	76 1	57 7	73 8	55 0	46 3	55 6
" 16...	78 7	74 2	73 3	68 11	61 4	75 2	55 6	55 11	61 4
" 23...	76 7	74 8	73 10	70 7	62 6	83 4	54 7	56 9	62 0
" 30...	72 1	74 8	73 3	60 4	60 1	86 7	49 0	57 11	61 10
Sept. 6...	71 6	72 3	73 4	59 3	60 4	89 3	46 7	56 9	61 1
" 13...	70 7	72 5	73 5	57 2	60 1	92 5	45 0	49 2	62 4
" 20...	70 8	72 6	73 4	56 10	60 4	94 7	45 8	49 11	61 3
" 27...	70 6	72 7	73 0	58 5	60 3	95 2	44 7	50 3	60 2
Oct. 4...	70 8	72 8	73 4	57 9	60 3	94 4	44 9	50 9	59 6
" 11...	71 0	72 6	73 1	58 5	60 3	95 5	44 5	51 6	58 10
" 18...	70 8	72 7	73 0	59 3	60 3	93 10	44 1	50 9	57 9
" 25...	70 10	72 5	73 0	60 1	60 3	95 1	43 0	50 5	57 5
Nov. 1...	70 4	72 4	72 9	59 11	60 3	96 0	42 4	50 8	56 4
" 8...	70 3	72 4	72 8	60 2	60 3	97 10	42 11	49 11	55 3
" 15...	70 3	72 5	72 7	60 2	60 3	100 7	43 0	49 10	55 7
" 22...	70 2	72 4	72 7	59 9	60 10	104 11	43 1	51 1	55 11
" 29...	70 2	72 3	72 7	59 3	62 2	107 9	44 6	50 4	56 0
Dec. 6...	70 7	72 4	72 7	58 7	62 6	108 11	43 5	51 4	55 10
" 13...	71 2	72 3	72 6	58 0	62 7	105 2	43 6	51 4	56 9
" 20...	71 1	72 4	72 6	57 7	62 3	103 6	44 2	50 5	56 3
" 27...	71 1	72 3	72 6	57 7	62 3	105 10	44 10	50 6	57 2

NOTE.—Returns of purchases by weight or weighed measure are converted to Imperial Bushels at the following rates: Wheat, 60 lb.; Barley, 50 lb.; Oats, 39 lb. per Imperial Bushel.

PRICES OF AGRICULTURAL PRODUCE.

AVERAGE PRICES of LIVE STOCK in ENGLAND and WALES
in December and November, 1919.

(Compiled from Reports received from the Board's Market
Reporters.)

Description.	DECEMBER.		NOVEMBER.	
	First Grade.	Second Grade.	First Grade.	Second Grade.
	per cwt. live weight. s. d.	per cwt. live weight. s. d.	per cwt. live weight. s. d.	per cwt. live weight. s. d.
FAT STOCK:—				
Cattle:—				
Polled Scots	83 1	77 3	79 6	74 4
Herefords	82 5	77 4	79 3	74 3
Shorthorns	82 5	77 4	79 1	74 2
Devons	82 1	77 1	79 0	74 1
Welsh Runts... ..	80 11	76 8	78 8	74 10
Fat Cows	77 4	69 3	74 1	66 4
	First Quality. per lb.* d.	Second Quality. per lb.* d.	First Quality. per lb.* d.	Second Quality. per lb.* d.
Veal Calves	17½	15	16	14
Sheep:—				
Downs	15½	15½	14½	14½
Longwools	15½	15½	14½	14½
Cheviots	15½	15½	14½	14½
Blackfaced	15½	15½	14½	14½
Welsh... ..	15½	15½	14½	14½
Cross-breds	15½	15½	14½	14½
	per score. live weight. s. d.	per score. live weight. s. d.	per score. live weight. s. d.	per score. live weight. s. d.
Pigs:—				
Bacon Pigs	23 0	23 0	21 0	21 0
Porkers	23 0	23 0	21 0	21 0
LEAN STOCK:—				
Milking Cows:—	£ s.	£ s.	£ s.	£ s.
Shorthorns—In Milk ...	58 17	44 2	56 16	42 18
„ — Calvers ...	53 1	39 13	52 12	39 0
Other Breeds—In Milk ...	—	—	—	—
„ — Calvers ...	—	—	—	—
Calves for Rearing ...	4 3	3 0	3 17	2 17
Store Cattle:—				
Shorthorns—Yearlings ...	15 1	12 4	15 3	12 2
„ —Two-year-olds ...	26 18	21 12	27 1	21 11
„ —Three-year-olds ...	37 9	33 4	37 7	32 3
Herefords—Two-year-olds ...	29 16	23 17	28 19	24 15
Devons— „ ...	27 8	22 16	27 18	23 9
Welsh Runts— „ ...	25 10	20 10	27 7	20 13
Store Sheep:—				
Hoggs, Hoggets, Tegs, and Lambs—	s. d.	s. d.	s. d.	s. d.
Downs or Longwools ...	73 9	56 11	63 3	50 9
Store Pigs:—				
8 to 12 weeks old	47 0	33 10	44 8	32 3
12 to 16 „ „	92 10	72 11	90 9	70 11

* Estimated carcass weight.

NOTE.—The prices per lb. for sheep do not include the value of the skins, which during December made prices equivalent to an additional 2½d. per lb. of the carcass weight for Downs, 3d. for Longwools, Cheviots, Blackfaced and Crossbreds, and 2½d. for Welsh, and during November, 2½d. per lb. for Downs and Welsh and 2½d. for Longwools, Cheviots, Blackfaced and Crossbreds.

AVERAGE PRICES of PROVISIONS, POTATOES and HAY at
certain MARKETS in ENGLAND in December, 1919.

(Compiled from Reports received from the Board's Market
Reporters.)

Description.	BRISTOL.		LIVERPOOL.		LONDON.	
	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.
	<i>s. d.</i>	<i>s. d.</i>	<i>s. d.</i>	<i>s. d.</i>	<i>s. d.</i>	<i>s. d.</i>
BUTTER :—	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.
British	—	—	—	—	—	—
Irish Creamery—Fresh	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.
„ Factory	—	—	—	—	—	—
Imported (Controlled)	252 0	—	252 0	—	252 0	—
CHEESE—						
British—						
Cheddar	157 0	—	—	—	157 0	—
Cheshire	—	—	120 lb. 168 6	—	120 lb. 168 6	—
Canadian	149 6	—	per cwt. 149 6	—	per cwt. 149 6	—
BACON :—						
Irish (Green)	202 6	—	202 6	—	202 6	—
Canadian (Green sides)	192 0	—	192 0	—	192 0	—
HAMS :—						
York (Dried or Smoked)	—	—	—	—	—	—
Irish (Dried or Smoked)	—	—	—	—	—	—
American (Green) (long cut)	195 0	—	195 0	—	195 0	—
EGGS :—	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.
British	—	—	—	—	50 0	—
Canadian	—	—	37 6	36 5	40 0	38 0
American	36 2	33 0	33 11	31 7	35 2	33 2
POTATOES :—	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.
Arran Chief	240 0	206 0	—	—	260 0	240 0
Edward VII.	276 0	257 0	253 0	243 6	270 0	250 0
Other Late Varieties...	260 0	240 0	201 6	178 6	260 0	240 0
HAY :—						
Clover	—	—	—	—	309 0	284 0
Meadow	—	—	—	—	300 0	280 0

**AVERAGE PRICES OF DEAD MEAT at certain MARKETS in
ENGLAND in December, 1919.**

*(Compiled from Reports received from the Board's Market
Reporters.)*

Description.	Quality.	Birming- ham.	Leeds.	London.	Man- chester.
		per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.
BEEF :—					
English	1st	140 0	140 0	140 0	140 0
	2nd	140 0	140 0	140 0	140 0
Cow and Bull	1st	140 0	140 0	140 0	140 0
	2nd	140 0	140 0	121 6	121 6
Irish: Port Killed	1st	—	—	140 0	—
	2nd	—	—	140 0	—
Argentine Frozen—					
Hind Quarters	1st	126 0	126 0	126 0	126 0
Fore „	1st	98 0	98 0	98 0	98 0
Australian Frozen—					
Hind Quarters	1st	126 0	—	126 0	126 0
Fore „	1st	98 0	—	98 0	98 0
New Zealand Frozen—					
Hind Quarters	1st	—	—	126 0	126 0
Fore „	1st	—	—	98 0	98 0
VEAL :—					
British	1st	98 0	98 0	98 0	98 0
	2nd	—	98 0	98 0	98 0
MUTTON :—					
Scotch	1st	147 0	147 0	147 0	147 0
	2nd	147 0	147 0	147 0	147 0
English	1st	147 0	147 0	147 0	147 0
	2nd	147 0	147 0	147 0	147 0
Irish: Port Killed	1st	—	—	—	—
	2nd	—	—	—	—
Argentine Frozen	1st	98 0	98 0	98 0	98 0
New Zealand „	1st	—	—	98 0	98 0
Australian „	1st	—	—	98 0	98 0
LAMB :—					
British	1st	—	—	—	—
	2nd	—	—	—	—
New Zealand	1st	98 0	—	98 0	98 0
Australian	1st	—	—	98 0	98 0
Argentine	1st	98 0	98 0	98 0	—
PORK :—					
British	1st	—	—	163 6	149 6
	2nd	—	—	—	—
Frozen	1st	—	—	133 0	—

DISEASES OF ANIMALS ACTS 1894 to 1914.

NUMBER OF OUTBREAKS, and of ANIMALS Attacked or Slaughtered.

GREAT BRITAIN.

(From the Returns of the Board of Agriculture and Fisheries.)

DISEASE.	DECEMBER.		TWELVE MONTHS ENDED DECEMBER.	
	1919.	1918.	1919.	1918.
Anthrax :—				
Outbreaks	22	22	234	245
Animals attacked	34	24	14	282
Foot-and-Mouth Disease :—				
Outbreaks	5	—	75	3
Animals slaughtered as diseased or exposed to infection ...	371	—	3,437	49
Glanders (including Farcy) :—				
Outbreaks	3	3	25	34
Animals attacked	3	6	61	98
Parasitic Mange :—				
Outbreaks	422	472	5,015	4,483
Animals attacked	729	967	9,861	8,422
Rabies :—				
Number of cases	2	22	155	108
„ „ Dogs affected ...	2	15	150	98
„ „ other animals affected ...	—	7	5	10
Sheep-scab :—				
Outbreaks	117	48	438	352
Swine Fever :—				
Outbreaks	146	107	2,305	1,407
Swine slaughtered as diseased or exposed to infection ...	43	36	1,039	562

IRELAND.

*(From the Returns of the Department of Agriculture and Technical
Instruction for Ireland.)*

DISEASE.	DECEMBER.		TWELVE MONTHS ENDED DECEMBER.	
	1919.	1918.	1919.	1918.
Anthrax :—				
Outbreaks	—	—	—	2
Animals attacked	—	—	—	2
Glanders (including Farcy) :—				
Outbreaks	—	—	1	—
Animals attacked	—	—	1	—
Parasitic Mange :—				
Outbreaks	5	3	140	98
Sheep-scab :—				
Outbreaks	41	56	298	352
Swine Fever :—				
Outbreaks	3	8	34	36
Swine slaughtered as diseased or exposed to infection ...	10	9	106	138

The Weather in England during December.

District.	Temperature.		Rainfall.				Bright Sunshine.	
	Daily Mean.	Diff. from Average.	Amount.		Diff. from Average.	No. of Days with Rain.	Daily Mean.	Diff. from Average.
	°F.	°F.	In.	Mm.*	Mm.*		Hours.	Hours.
<i>Week ending 6th Dec.:</i>								
England, N.E. ...	40·6	+0·5	0·44	11	— 6	6	1·4	+0·1
England, E. ...	42·3	+1·8	1·79	45	+29	7	1·4	0·0
Midland Counties ...	42·1	+2·1	1·33	34	+16	7	1·2	—0·1
England, S.E. ...	43·8	+1·6	2·05	52	+28	7	1·5	0·0
England, N.W. ...	42·8	+1·2	1·07	27	+ 1	7	0·8	—0·3
England, S.W. ...	45·0	+1·4	2·73	69	+33	7	1·4	—0·2
English Channel ...	48·3	+1·2	1·52	39	+ 6	6	1·4	—0·4
<i>Week ending 13th Dec.:</i>								
England, N.E. ...	37·6	—2·3	0·38	10	— 3	5	1·5	+0·2
England, E. ...	37·2	—3·0	0·37	9	— 6	4	1·5	+0·2
Midland Counties ...	39·0	—0·7	0·20	5	—13	3	1·7	+0·5
England, S.E. ...	39·3	—2·7	0·23	6	—13	3	1·6	+0·1
England, N.W. ...	40·6	—0·5	0·38	9	—14	3	2·2	+1·2
England, S.W. ...	42·3	—0·9	0·84	21	—10	5	2·7	+1·3
English Channel ...	44·6	—2·1	0·34	9	—17	5	2·6	+0·8
<i>Week ending 20th Dec.:</i>								
England, N.E. ...	41·3	+2·5	0·87	22	+11	5	0·6	—0·5
England, E. ...	40·8	+1·9	0·35	9	0·0	6	0·4	—1·0
Midland Counties ...	42·0	+3·4	0·76	19	+ 8	5	0·6	—0·5
England, S.E. ...	43·0	+2·5	0·62	16	+ 3	5	0·6	—0·9
England, N.W. ...	43·5	+3·2	1·30	33	+16	6	0·7	—0·3
England, S.W. ...	44·8	+2·5	0·99	25	+ 3	6	1·0	—0·4
English Channel ...	47·3	+1·6	0·55	14	— 3	6	0·7	—1·0
<i>Week ending 27th Dec.:</i>								
England, N.E. ...	38·6	0·0	0·70	18	+ 7	5	1·2	+0·1
England, E. ...	41·1	+2·8	0·90	23	+11	6	1·2	+0·1
Midland Counties ...	41·8	+3·4	1·14	29	+14	6	1·2	+0·2
England, S.E. ...	43·8	+3·6	0·94	24	+ 8	6	0·9	—0·3
England, N.W. ...	41·7	+1·8	1·83	46	+27	6	0·9	—0·1
England, S.W. ...	45·0	+3·0	1·48	37	+10	7	1·0	—0·1
English Channel ...	48·0	+2·7	1·47	37	+14	7	1·4	—0·3

* 1 inch = 25·4 millimetres.

The FARMERS' "WARDEN" POLICY

FOR INSURANCE OF
HORSES and CATTLE.
STALLIONS, BROOD MARES, FOALS.
EMPLOYERS' LIABILITY.
FIRE. DRIVERS' ACCIDENTS.
MOTOR CARS, FARM TRACTORS,
and GENERAL INDEMNITIES.

For Best Rates and Terms apply—

WARDEN INSURANCE COMPANY, LTD.

FORMERLY KNOWN AS

The Horse, Carriage and General Insurance Company, Ltd.
ESTABLISHED 1877.

Honoured with the Patronage of H.M. THE KING.

Chief Office — 21, IRONMONGER LANE, LONDON E.C. 2.

MANAGER AND SECRETARY: R. R. WILSON.



MINIATURE MEDALS.

THE Goldsmiths and Silversmiths Company have available, or can supply to order, Miniature Medals and Orders of every description.

The Company's Miniature Medals are correct in every detail, and are of highest quality and finest workmanship.

WARNING.

The Goldsmiths and Silversmiths Company have no branch establishments in Regent Street, Oxford Street or elsewhere in London—only one address—

**THE
GOLDSMITHS & SILVERSMITHS
COMPANY LTD.** *with which is incorporated
The Goldsmiths' Alliance Ltd. Estd 1773*

112, Regent Street, London, W. 1.

BREEDERS' ANNOUNCEMENTS.

HORSES.

SHIRES.

JACKSON, J. C., ASKERN.—Breeder of Shires. Stallions: Tandridge Tip-Top 28851 by King of Tandridge 24351; Champion's Comrade 31298 by Childwick Champion 22215. Thirty other Stallions and Colts by fashionable sires kept for sale or hire. Fillies for sale.—Apply, FAULKNER, Smallages, Sykehouse, Goole, Yorks. Telegrams: Smallages, Stainforth, Doncaster. Stations: Askern, Moss, and Stainforth.

CLYDESDALES.

GRAHAM, ROBERT, KAIMFLAT FARM, KELSO.—Breeder and owner of high-class Clydesdale Stallions, Colts, and Fillies; most fashionable blood; large selection. Commissions executed. Station: Kelso.

PONIES.

KING, Mrs. A. C., BRAISHFIELD PONY STUD, ROMSEY, HANTS.—Hackney Ponies of the best blood always on sale. To view stud and for further particulars, apply Stud Groom. Telegrams; Braishfield. Station; Romsey.

CATTLE.

FRIESIANS.

E. R. DEBENHAM, BLADEN DAIRY FARMS, BRIANTSPUDDLE, DORCHESTER. Pure imported and imported bred bulls (sound tuberculin test). Services to approved females. Apply the Manager.

JERSEYS.

JEROME, Mrs., BILTON HALL, TOOKWITH, YORKS. Pedigree Jerseys. Heifers and young Bulls for Sale.

SHORTHORNS.

E. R. DEBENHAM, BLADEN DAIRY FARMS, BRIANTSPUDDLE, DORCHESTER. Herd typical dual purpose Shorthorns. Bull Thornby Duke (sound tuberculin test), sire Drusus with 15,791 lbs. milk in pedigree. Services to approved females. Apply to the Manager.

HOBBS, C. H., OLDPORT, OSWESTRY. Shorthorn herd; good families. Bulls for sale. Station: Oswestry (one mile).

WELBECK HERD OF PEDIGREE SHORTHORNS, the property of the Duke of Portland, K.G. Young bulls and heifers for sale, from the best strains.—Apply, ALEX. GALBRAITH, Norton, Cuckney, Mansfield.

DAIRY SHORTHORNS.

CHIVERS & SONS, LTD., HISTON, CAMBS. Long pedigree Dairy Shorthorns, best milking families; daily milk records. Young stock for sale.

MOBBS, R. W., & SONS, Kelmscott, Lechlade.—500 Dairy Shorthorns; milk records kept; many firsts Royal and London Dairy Shows. Pedigree Bulls and Bull Calves. 4-cross Bull Calves at moderate prices, suitable for non-pedigree dairy herds.

PLAYFORD HERD OF PEDIGREE DAIRY SHORTHORNS. Deep-Milking Strains of robust constitution. Bulls in service: Thornby Don (133918), Hermit II. (120697). Milk records kept, inspected by Dairy Shorthorn Association and Board of Agriculture Recorder. Young Bulls and Bull Calves for sale. Also Breeder of Pedigree Suffolk Sheep and Large Black Pigs.—S. R. SHERWOOD, Playford, Ipswich.

SILCOCK, R., & SONS, LTD., POULTON-LE-FYLDE, LANCASHIRE.—Herd of Pedigree Dairy Shorthorns. Milk records kept. (Inspected by the Dairy Shorthorn Association.) Young Bulls for sale from deep milking cows.

GRAIN SACKS

FOR SALE & LENT ON HIRE.

CHISHOLM & CO., Ltd.

18, JAMES STREET, LIVERPOOL.

Also HULL, MANCHESTER, GLASGOW, BELFAST, Etc.

BLOODSTOCK

AND OTHER

Live-stock Insurance

Special policies covering Bloodstock and other Live Stock against accident, disease, and practically every other serious risk are issued by the "British Dominions" at lowest rates consistent with soundness and financial stability. Prospectuses and full particulars forwarded free on application.

Transit Risks within the United Kingdom and to all parts of the World

Special attention is directed to the Farmers' Series of Policies—The Farmers' "Compleat" Indemnity Policy—The Farmers' "Compleat" Fire Policy—The Farmers' Life Assurance and Children's Educational Policies—The Farmers' "Tractor" Policy.

All Classes of Insurance Business Transacted

INCLUDING

Annuities — Boilers — Burglary — Contingency — Disease and Sickness — Electrical and Engineering Plant — Fidelity Guarantee — Fire — Indemnity — Leasehold Redemption — Lifts — Life — Loss of Profits — Marine — Motor Car — Personal Accident — Plate Glass — Public Liability — Securities in Transit — Sprinkler Leakage — The "ALL-IN" Policy for Householders and Houseowners.

Detailed particulars of any of the above classes free on application.

EAGLE STAR & BRITISH DOMINIONS INSURANCE COMPANY LTD

Head Office: British Dominions House, Royal Exchange Avenue, London, E.C. 3; 32, Moorgate St., E.C. 2 41 & 52, Threadneedle St., E.C. 2; 79, Pall Mall, S.W. 1; 296, High Holborn, W.C. 1; 37, Queen Victoria St., E.C. 4.

Branches and Agents throughout the United Kingdom.

Application for Agencies invited.

ASSETS EXCEED £17,000,000.

CATTLE—continued.

LINCOLN RED SHORTHORNS.

THE STAPLEFORD PARK HERD. A few young Bulls always for sale from carefully tested milking strains only. Apply C. S. Harvey, Wymondham, Oakham.

KERRY AND DEXTERS.

BRAISHFIELD MANOR HERD of Dexter Cattle. Prizes won 1915 include Championship R.A.S.E., Nottingham, first London Dairy Show.—Apply, Mr. W. A. OWEN, Elm Grove, Braishfield, Romsey.

PALMER, R. E. Pure Pedigree Kerry Cattle, Oaklands Park, Newdigate, Surrey.

HEREFORDS.

WHITE, W. J. S., ZEALS, WILTS.—Old-established Herd of Milking Herefords, Bulls and Calves, for Sale.

SHEEP.

LINCOLN LONGWOOL.

HOYLES, GEO., SKIDBY MANOR, near HULL.—Pure Lincoln Longwool Sheep; true type, sound conditions, lustrous long wool, give satisfaction at home and abroad.

OXFORD DOWN.

AKERS & CO., BLACK BOURTON, OXON.—Registered Oxford Downs, Rams and Ewe Lambs on Sale; inspection invited.

PIGS.

BERKSHIRE.

BRAISHFIELD MANOR HERD OF BERKSHIRE PIGS. Boars in use: Little John, Champion R.A.S.E., 1915, etc.; also Hugo, whose stock sold so well at Mr. Hiscock's Sale. Young stock of the best blood always for Sale.—Apply, Mr. W. A. OWEN, Elm Grove, Braishfield, Romsey.

LARGE WHITE.

CHIVERS & SONS, LTD., HISTON, CAMBS.—Pedigree Large White rigs, fine quality, good type, best strains. Young Stock for Sale.

DENNY, E. H. M., STAPLEFIELD PLACE, STAPLEFIELD, SUSSEX.—Large White Yorkshire Pedigree Pigs. Station: Haywards Heath. Telegrams: Handcross.

GREENALL, SIR GILBERT, BART., C.V.O., WALTON HALL, WARRINGTON. The Walton and Worsley Herd of Pedigree Large White Pigs. Selections of all ages for sale at moderate prices. Apply to RICHMOND DAYBELL, Manager, Rowswood Farm, Higher Walton, near Warrington. Station: Warrington. Telegrams: Daybell, Higher Walton, Warrington.

MIDDLE WHITE.

ARCADIAN HERD MIDDLE WHITE PEDIGREE PIGS. Best winning strains. Prolific breeders. Hardy grazing pigs, out all the year round. Particulars from EDGAR H. ROBINSON, Brompton House, Scarborough.

CHIVERS, JOHN, HISTON, CAMBS.—Pedigree Middle White Herd, containing best possible strains, including Royal champions. Young Stock for Sale.

EDGE, S. F., GALLOPS HOMESTRAD, DITCHLING, SUSSEX.—Albany Herd of Pedigree Middle Whites. Bred on open air system. Wonderful doers and breeders. Will thrive anywhere.

KESTON HERD OF PEDIGREE MIDDLE WHITE PIGS, owner Dr. M. J. Rowlands. Strains from all the best known herds. Reared on open-air system, out winter and summer; the only way to breed pigs free from tuberculosis. All pigs guaranteed true to type, size, and, above all, health. Prices from 2 guineas per month. Apply Nash Farm, Keston, Kent.

JEROME, MRS., BILTON HALL, YORK.—Pedigree Middle White Pigs, prize-winners. Boars and Gilts for sale.

**"PREMIER" BRAND
PRIZE DAIRY SALT.**

**Guaranteed Pure and
free from adulteration.**

Used by the leading Dairies at Home and Abroad, including nearly all the winners of the Cheshire Cheese and Butter Honours, and the Affiliated Dairy Association of New Zealand.

Packed in Bags.

SALT.

**"PREMIER"
LAND SALT**

(cleaned and soiled) in Truck loads (7 to 10 tons) to any Railway Station.

**We manufacture Salt
for all purposes.**

Send for prices, &c., and for Leaflet on "The Use of Salt in Agriculture," to
THE PREMIER SALT CO., WINSFORD, CHESHIRE.

BAXENDALES

can supply from Stock

**Overtime Tractors, Manual Delivery Reapers,
BEST BINDER TWINE, TURNIP THINNERS.**

ORDERS NOW BEING BOOKED FOR

AUSTIN TRACTORS

AND

Silver Medal (Cardiff) Unchokable Manure Distributors.



THE PLASTIC COMPOUND FOR REPAIRING

LEAKY ROOFS

ON ALL FARM BUILDINGS.

Easily applied with a trowel—Sticks anywhere and makes roofs permanently watertight.

“BEANCOLITE”

THE SURE PREVENTATIVE OF DECAY, DRY ROT,
& FUNGOID GROWTHS IN ALL KINDS OF TIMBER.

Invaluable for Fences, Hoardings, Sheds and Wooden
Erections of every description.

Baxendales, Miller Street, Manchester.

PIGS—continued.

MIDDLE WHITE—continued.

STAPLEFORD HERD OF MIDDLE WHITE PIGS. A few choice gilts and boars always for sale at reasonable prices. C. S. HARVEY, Wymondham, Oakham.

THE WHARFEDALE HERD OF PEDIGREE MIDDLE WHITE PIGS.—Royal Show record:—Won Championship 1908, 1909, 1910, 1913, 1914, 1915, and 1919. Also First Prize for pen of three gilts at ten successive Shows. Well-known characteristics of the Herd are true type and fine quality combined with size and sound constitution. Prompt and careful attention to all enquiries and orders.—Apply LEOPOLD C. PAGET, Middlethorpe Hall, York.

LARGE BLACK.

EDGE, S. F., GALLOPS HOMESTEAD, DITCHLING, SUSSEX.—Pedigree Large Blacks, marvellous open air strain.

LUDLOW HERD OF LARGE BLACK and ASHFORD HERD OF MIDDLE WHITE PIGS.—Pedigree Boars and Gilts for sale; bred on open air system from unrelated stock; eligible for Herdbooks.—Apply MANAGER, Woodlands Pig Farm, Ludlow, Shropshire.

NEWHOUSE HERD of Pedigree Large Black Pigs. Boars and Gilts from best strains.—ROBERT FORTUNE, Newhouse, Cranleigh, Surrey.

PICKWELL HERD of Pedigree Large Pigs. Boars and Gilts from best strains at reasonable prices. Captain CLAUDE W. HEMP, Pickwell, Bolney, Sussex.

DUNSTALL HERD of Pedigree Large Blacks, bred from prize strains under natural conditions. Prolific, hardy, grand doers and of choice type. Young Boars and Gilts. Prices Moderate.—LIONEL E. HORNE, Moreton-in-Marsh, Glos.

GLOUCESTER OLD SPOT.

THE FAIRFIELD HERD OF GLOUCESTER OLD SPOT PIGS for Sale. 100 to choose from, including winners at Hereford and Worcester Show. Gilts, Boars, and Sows with litters; also, owing to change of blood, several Boars by Berkeley Foreman.—J. B. DOWDING, Fairfield, Leominster.

THORNBURY HERD GLOUCESTER OLD SPOTS, comprising Berkley, Gilslake, Oaklands and other noted strains. Gilts and Boars always for sale.—Apply BENNET & HOWARD, Quarry Farm, Thornbury, Glos.

LINCOLNSHIRE CURLY-COATED.

CHARNWOOD HERD.—A grand lot of young Boars ready for service, all descended from Royal winners. Inspection invited.—G. SIMPSON, Charnwood, Loughborough, Notts.

POULTRY.

MAJOR, ARTHUR C.—Breeder and Exhibitor thirty years. Champion Dark and Silver Grey Dorkings, "England's best fowl." Prizes at all Shows, and exported all over the world. Prices moderate. Eggs, 1s. each.—ARTHUR C. MAJOR, Ditton, Langley, Bucks.

AUCTIONEERS, LIVE STOCK, ETC., AGENTS.

FOPE & SMITH (C. T. SMITH, F.A.I.), Auctioneers, Valuers and Estate Agents, LEDBURY, HEREFORDSHIRE. Sales of Live and Dead Farming Stock. Commissions carefully executed. Correspondence invited.

WATERS & RAWLENCE, SALISBURY.

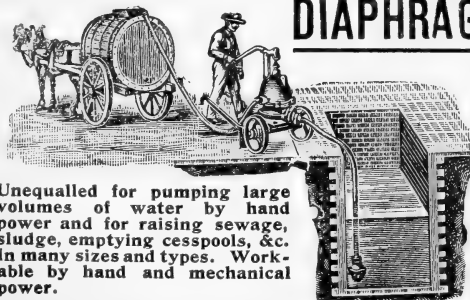
MISCELLANEOUS ADVERTISEMENTS (*Cheap Prepaid*).

For Oleft Chestnut Unclimbable Fencing, apply to THE STANLEY UNDERWOOD COMPANY, LIMITED, Shottermill, Haslemere, Surrey.

64 Page Book about Herbs and How to Use Them, 2d.—TRIMNELL, THE HERBALIST, RICHMOND ROAD, CARDIFF.

All applications for Advertisements in "The Journal of the Board of Agriculture" should be addressed to C. VERNON & SONS, LTD., 38, Holborn Viaduct, London, E.C. 1.

DIAPHRAGM PUMPS



Unequalled for pumping large volumes of water by hand power and for raising sewage, sludge, emptying cesspools, &c. In many sizes and types. Workable by hand and mechanical power.

Is, and always has been, an entirely BRITISH COMPANY.

Entirely British Made.

SIMPLE AND ELIABLE.

With Improved Valves (Patented.)

Cannot choke or get out of order.

The Pump for FARMS, ESTATES, &c.

Fully Illustrated Catalogue sent free on request to



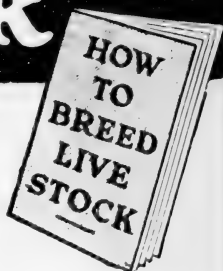
Telegrams: "Honig, London."
Telephone: 10819 Central.

HONIG & MOCK, LTD., 7, Mark Lane, LONDON, E.C. 3.

How to Breed Live Stock

Write For FREE BOOK.

Tear out coupon NOW. Get our wonderful free booklet "How to Breed Live Stock." Gives valuable information on the breeding of horses, cattle, swine and sheep. Shows pictures of breeding organs. Gives wonderful descriptions and valuable advice. Use coupon NOW. This book FREE!



Let this free booklet show you the way to bigger live stock profits. How much would it help you if you knew the real reasons why your mares, cows, sows or ewes sometimes fail to breed—why so many animals die at birth—how to prevent abortion—how to prevent and cure the diseases which weaken and kill your cattle—how to care properly for breeding animals—how to control heredity—how to breed successfully by capsule—how to improve and strengthen an individual animal or an entire herd—how to judge instantly fertility, vigor, longevity, good mothers and pleasant dispositions. How much, in real money value, would knowledge like this mean to you?

How to Prevent Abortion.

That is the title of one of the valuable chapters in this FREE book. A few of the other chapters are: Why So Many New Born Animals Die, How to Care for Breeding Animals, How to Control Heredity, The Fine Points of Scientific Breeding. Don't miss this free book. It's filled with money-saving points. It also tells all about our famous Course in Animal Breeding—a simple, practical, home-study course that will really show you just

how to cut down your expenses and losses and increase the value of your stock.

Increase your live stock profits. Strengthen and increase your herds. Prevent abortion and sterility. Double the value of your herds and individuals. We have brought the school to the breeder and hundreds of breeders all over the country have benefited. Read this valuable free booklet explaining all. Post coupon NOW.

Send Coupon NOW.

Tear out the coupon printed below. Post it AT ONCE. This free book tells how you can easily master scientific breeding at home and is also filled with valuable information you can use profitably day after day, year after year. Don't fail to read it. Send coupon NOW.

**National School of Animal Breeding,
Dept. 142, Pleasant Hill, Ohio, U.S.A.**

National School of Animal Breeding,
Dept. 142, Pleasant Hill, Ohio, U.S.A.

Send me your free booklet "How to Breed Live Stock."

Name _____

Address _____

'UTILITY'

FEEDING

TREACLE

ABSURDLY CHEAP.

**R
e
d**

Pure Cane. Now very cheap. Nutritious, great conditioner. Lowest spot prices. Insist on 'Utility' Brand. Red label casks.

**T
r
a
d
e**

All classes feeding stuffs supplied. Write: FEED DEPT., ARGYLE MILLS, ARGYLE STREET, LIVERPOOL.

**M
a
r
k**

Cheap parcels of game feed always an offer.

DUNNS FARM SEEDS,

Dunnseed Chambers, Salisbury.

Dunns Recleaned Permanent Pasture Seeds to suit the Soil and Climate and to produce valuable produce for both Hay and Grazing.

Specialist in Milk Producing Plants.

Free Advice on all Farm Crops.

**Farm Plant Museum and Farm Laboratories
always opened for inspection.**

DUNNSEED CHAMBERS, SALISBURY.

**Agricultural
Department**
of the
C.W. S.

**1, BALLOON STREET,
MANCHESTER.**

**This Department supplies everything
for the Farm, Estate, Small Holding,
Allotment and Garden**

THROUGH

**Agricultural and other Distributive
Co-operative Societies in all parts
of the country.**

THE

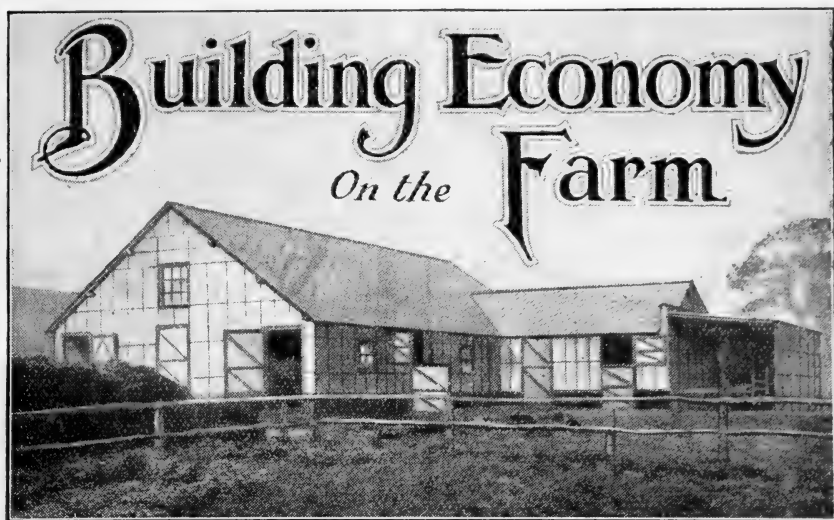
CO-OPERATIVE WHOLESALE SOCIETY,
LIMITED,

In addition to—

*Owning Farms,
Flour Mills,
Oil Mills, etc.*

SUPPLIES EVERYTHING FOR THE FARM.

SEEDS OF THE HIGHEST STANDARD.



Cow-houses

“ÆGIS” Asbestos-Cement Building materials are superseding corrugated iron and boards and felt for all agricultural purposes.

Farm Buildings of all kinds quickly and cheaply erected—with local labour.

“ÆGIS” Sheets and Slates require no tarring nor painting—they improve with exposure.

Invaluable for Dutch Barns, covered Stock Yards, Cart and Implement Sheds, and all outhouses.

For inside work—lining walls and underdrawing roofings, replacing lath and plaster.

Also suitable for Bungalows, Shooting Boxes, Farm Cottages, Garages, &c.

Write us if you cannot obtain readily.

TURNER BROTHERS ASBESTOS
CO. LTD.

ROCHDALE



The Cake that Pays for its Cost.

A BRITISH MADE CAKE

of GUARANTEED PURITY
and PERFECT CONDITION.

NOT A COMPOUND CAKE.

MOTHER NATURE'S OWN
Food for increasing Milk Supply.

EASY OF DIGESTION.

Suitable for all kinds of Young Stock.

A Postcard will bring you Samples and Booklets from
Sole Manufacturers:—

LODERS & NUCOLINE, Limited,
Cake and Meal Dept.,
1, Crutched Friars, LONDON, E.C. 3.

MARS OIL British Made



TRADE MARK.

For Preserving,
Softening &
Waterproofing
**BOOTS,
LEGGINGS,
HARNESSES,
SADDLERY,
LEATHER
APRONS &
COVERS,**
and all kinds of
Leather Articles

AS SUPPLIED TO THE MINISTRY OF MUNI-
TIONS, H.M. DOCKYARDS, THE MILITARY,
AND FARMERS, Etc.

NO "RUBBING IN" REQUIRED.

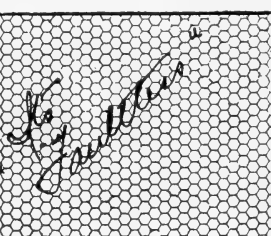
In Tins with Brush complete, at 1/6, 3/- & 6/- each, or

2/-, 3/6 and 6/9, post free.
1 gallon Cans **18/-** carriage forward.

THE MARS OIL (B.A.) Co.

(Proprietor: F. GREINER),

10 & 12, MILTON STREET LONDON, E.C.



"FAULTLESS"

Galvanized Rabbit and Sheep
Netting is of
GUARANTEED QUALITY.

THE old bugbear of curvy and bulgy netting has
been overcome in "FAULTLESS." When un-
rolled it lies DEAD FLAT—like a carpet.

It is made of the finest grade wire, specially
selected for its high tensile strain, and is heavily
coated with purest virgin spelter, thus ensuring
durability.

"FAULTLESS" NETTING IS OF THE
HIGHEST POSSIBLE QUALITY AT THE
LOWEST POSSIBLE PRICE.

Send us particulars of your requirements and
we will gladly quote carriage paid prices for large
or small quantities direct from works.

DAVID & Co.,
Taff Vale Ironworks,
CARDIFF

My Book



**How to
Break
and Train
Horses**

FREE

BIG MONEY IN "ORNERY" HORSES

MY free book will amaze you. See the big
money that is being made by those I
taught my famous system of horse breaking
and training! Wild colts and vicious, unman-
ageable horses can be picked up for a song.
By my methods you can quickly transform them into
gentle, willing workers and re-sell them at a big profit.
You can also earn fat fees breaking colts and training
horses for others.

Write! My book is free, postage prepaid. No obli-
gation. A postcard brings it. Write today.

Prof. JESSE BEERY,

142, Main St., Pleasant Hill, Ohio, U.S.A.

This Book is Yours—IF

Hunter's Farm Seed Catalogue is rightly recognised by all progressive Agriculturists to be the Standard of what a Seedman's Price List should be.

Professors of Agriculture, Agricultural Lecturers, Heads of Agricultural Colleges, and Officials of Boards of Agriculture at home and abroad regularly apply for copies, because the book possesses sound, practical and informative contents, of real value to Agriculturists everywhere.

A Farmer wrote recently to say:

***"I date my farming success from
"the day I wrote for your Seed List."***

We shall publish about the end of January, 1920, and it will be better, bigger, more informative and useful than ever.

The Book is Free, but production costs are high, so because we do not want you to be disappointed will you please write NOW and ask us to reserve your copy for you.

There is a copy
Ear-Marked for YOU—IF

you send us your name and address and say that you want it.

Address a postcard to-day to—

The Manager, Publishing Department "J.B.,"
JAMES HUNTER, Limited,
FARM SEED SPECIALISTS,
CHESTER.

RATS.

THE NEW ACT.

E. WELSH & CO., R.C.S.E.,

46a, Anlaby Road, Hull.

Tel: Cent. 3070 Hull.

Ship Sanitary Experts

AND

Vermin Exterminators.

ALL WORK GUARANTEED.

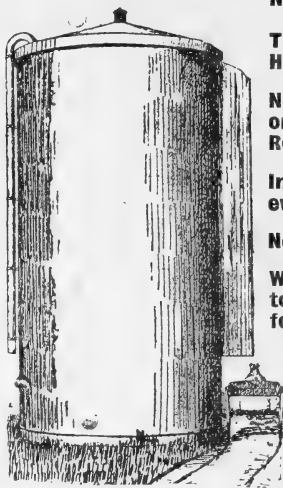
EXECUTED BY SKILLED OPERATORS.

Sole Contractors to—

**Ellerman Shipping Lines,
Elder Dempster Line,
North Eastern Railway,
Hellyers and Great Northern
Steam Fishing Co.,
etc., etc., etc.**

REINFORCED CONCRETE SILOS.

BETTER AND CHEAPER THAN TIMBER.



**No Slackening
and
Tightening of
Hoops and Stays.**

**No Painting
or Tarring
Required.**

**Indestructible
even by fire.**

No Upkeep.

**Water Tower on
top if necessary
for Farm use.**

**We have these
SILOS in
course of con-
struction in
England and
Scotland.**

Estimates and References on Application.

**JAMES SCOTT & SON (Aberdeen),
Limited,
GEORGE STREET and JOHN STREET,
ABERDEEN.**

LIME.

BUY ONLY THE BEST.

**The BUXTON LIME FIRMS
COMPANY, Ltd.,**

Royal Exchange, Buxton.

Telegrams—Buxton Lime, Buxton. 'Phone—312 Buxton.

THE PUREST LIME KNOWN
IN COMMERCE & THE
LARGEST OUTPUT OF LIME &
LIMESTONE IN THE WORLD.

LIME BURNT IN Agriculture, Florists,
SPECIAL KILNS FOR and Fruit Growers
SPECIAL TRADES. catered for specially.

AGENTS THROUGHOUT GREAT BRITAIN.

Lime in any Form, in any Quantity to suit Users.

PERTHSHIRE AND FORFARSHIRE SEED POTATOES.

No better stocks of leading varieties
obtainable.

Inquiries invited.

**WILLIAM ROBERTSON,
Seed Potato Growers,
PERTH.**

**Milk Selling is so much less labour than
Butter-making and will prove more
profitable.**

MILK

The Wilts United Dairies, Ltd.,

93, Albert Embankment, London, S.E. 11,

are buyers at any London Station.

Correspondents should state Quantity and Prices.



Telegrams:

McHATTIE,

CHESTER.

Telephone:

No. 74,

CHESTER.

McHATTIE & Co., SEEDSMEN & NURSERYMEN, CHESTER.

Specialists in
AGRICULTURAL SEEDS,
GRASSES. CLOVERS, SWEDES,
MANGELS. SCOTCH SEED GRAIN.
GUARANTEED PURITY AND GERMINATION.

New introduction for 1920,

"VICTORY SWEDE"

(Stock limited).

Our Farm Seed List, when ready, will be posted free on application. Issued February 1st.



SAVE-The-HORSE

(Trade Mark, Registered)

is sold with a signed Guarantee to cure Ringbone, Thoropin, SPAVIN or Shoulder, Knee, Ankle, Hoof or Tendon Disease or money back. Try it, no matter how stubborn or supposedly incurable—hundreds of such cases cured every year for 22 years. Write for FREE Save-the-Horse BOOK that tells how to diagnose and treat—also a copy of Guarantee and expert veterinary advice—all FREE. Always keep a bottle on hand for emergencies.

Mr. A. Smart, Leith, writes:—"We are highly satisfied with the results obtained by the use of your Remedy, and we shall certainly always keep a bottle on hand for emergency."

Address **PREMIER SALES, Limited,**

25a, MANESTY'S LANE, LIVERPOOL,

Sole Distributors of
SAVE-THE-HORSE in the U.K. for the Troy
Chemical Co.

THOS. BOAG & Co., Ltd., Sack Manufacturers & Merchants, GREENOCK, SCOTLAND.

SACKS AND BAGS.

New Bags, Second-hand Bags, and New
Calcutta Bags of all kinds, suitable for Seeds,
Produce, Fertilisers, and Feeding Stuffs.

SEWING AND TYING TWINES.

Stocks always available for prompt delivery.

BUYERS OF EMPTY BAGS OF ALL CLASSES.

Prices c.i.f. any port in the world quoted on application.

Telephones: 825, 826, and 827, Greenock.
302 (Central), Glasgow.
813, Aberdeen.

Telegrams: Jute Greenock.
Bags Glasgow.
Twills Aberdeen.

Aberdeen Branch: 12, Virginia Street. Glasgow Branch: 38, Elliot Street.

Codes Used: A. B. C. 4th & 5th Editions, Western Union, Marconi International & Private.

SACKS AND BAGS

Telegrams :
"TARPAULINS,"
LIVERPOOL.

Telephones :
1054 CENTRAL
(3 lines).

PETER MARSH & SONS,

**17, BRUNSWICK STREET,
LIVERPOOL.**

**BUYERS of USED
Grain, Flour, Thirds,
Bran, &c., Sacks and
Old Bagging.**

**SELLERS
of every description,
NEW and USED.**

HALL & CO., LTD.

'Phone : Purley 10.

**Lime Burners,
COULSDON, L.B. & S.C. Ry.**

**GROUND
CARBONATE OF LIME**

(For Agricultural Purposes)

17/6 per Ton loaded in Bulk F.O.R. Couls don
Orders should be booked at once to secure
prompt delivery.

WHITE LUMP & GROUND LIME

For Agricultural Purposes.

All kinds of **CHALK** supplied from **Lump
Chalk** for road making down to extremely
Fine Powdered Chalk for
Pharmaceutical purposes.

Head Office :

Victoria Wharf, E. Croydon.

TELEGRAMS :
"CEMENT, CROYDON."

'PHONE :
"CROYDON, 1104."

START 1920 RIGHT.

The Fish Meal Manufacturers Association

invite the earnest co-operation of all farmers in giving
a fair impartial trial to

FISH MEAL

on account of its most valuable feeding properties for
all kinds of stock. The Association is desirous of
refuting the unjustifiable prejudice in some quarters
that Fish Meal taints Cattle, Poultry, or Eggs. Given
in the correct proportions set out in the Association's
pamphlet it cannot possibly leave any taint. One fact
alone repudiates such an assertion. Before the War
30,000 tons of Fish Meal were exported annually, and
twice this quantity would have been taken if obtain-
able. To-day a higher price than charged in this
Country would be willingly paid by the Continent
could they but obtain supplies. Surely this of itself
ought to dispel for ever the unfounded allegation of
tainting.

Write Department "I" for full details.

**FISH MEAL
Manufacturers Association
LOW LIGHTS, NORTH SHIELDS.**

Insist on the Guarantee.



M.A.A.

Telegrams:—

"MacDonald" Perth.

'Phone No. 42.

James MacDonald & Son,

City Mills, PERTH, N.B.

Millers and Grain Merchants.

**Best Scotch Oatmeal and Pot
Barley.**

**Best selections Seed Grain,
Oats, Wheat, Barley.**

**Cheap Albuminoids for Poultry.
"RENTOX"**

(Registered.)

**Prepared from fresh, sweet
sterilised blood.**

ALL FOOD. PURE FOOD.

**"Rentox" contains about 90 per cent.
Albuminoids.**

Send for sample box and printed matter, Ninepence, post
free, to Sole Proprietors and Manufacturers—

**MIDLAND CATTLE PRODUCTS, Ltd.,
"Rentox" Department,
DIBBETH, BIRMINGHAM.**

THREE HUNDRED CANDLE POWER OIL VAPOR LAMP

No. 304.

Safety Guaranteed.
Satisfaction Guaranteed.

ADOPTED BY
U.S.A. GOVERNMENT.

STORM PROOF.
CANNOT CLOG.

Burns 15 hours to one
Charge, costs 1d. per hour.

Gives the strongest
Whitest Light existing
and beats
every other light,
including electricity.

It will illuminate a
Barn Yard 600 ft. square.

Height: 14 inches.
Weight: 4 lbs.

The Lantern proves its
worth best in the wild
winter storm. It is the one
great light not affected
by wind or snow, or sleet
or cold. Its brilliant rays
penetrate the deepest
gloom on a stormy night.
It is steady as the sun
under the most trying
conditions.

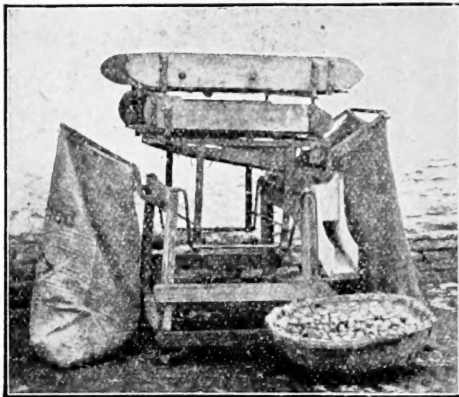
IT'S THE LIGHT
THAT NEVER FAILS.

Ask your Ironmonger for
One or send your 42/6
and Name and Address
to—



Stanleys (Stratford) Limited, London, E.15.

WALLWORTH'S PATENT POTATO SORTER.



A GREAT LABOUR SAVER.

Light in weight, easily worked, and
adjustable bag-holders.

Write for list and copies of testimonials.

HENRY WALLWORTH,
Tytherington, MACCLESFIELD.

"Castle" Cane Feeding Treacle.

(Feeding with sweetness.)

In 6 cwt. barrels on rail Liverpool, London, Hull.

Used by many well-known farmers and
Institutions.

Compound Cakes, Indian Corn, Indian Meal,
Barley Meal, Dried Grains, Locust Beans, Fish
Meal, Meat Meal, Clover Meal, Linseed Cake, &c.

Farm Engines, Incubators, reeders
Poultry Houses.

J. R. GODFREY SMITH,
Bishops Castle, Salop.

Bankers:—

Manchester & Liverpool District, Market Drayton, Salop.

J. D. CAMPBELL,

Manufacturer of NICOTINE in Bond from duty-
free Tobacco.

Nicotine makes the very finest Insecticide for fumi-
gating, vapourising, or spraying to destroy insects
infesting vegetation. *Your inquiries solicited.*

LUND STREET, CORNBROOK, MANCHESTER.

**THE WEST OF SCOTLAND
AGRICULTURAL COLLEGE,**
Blythswood Square, Glasgow.

Dairy School, Farm, and Poultry
Department at Kilmarnock.

PROSPECTUS FREE.

Lancashire, Cheshire, Shropshire & North Wales.

Messrs. BOULT, SON & MAPLES,
VALUERS, SURVEYORS, ESTATE AGENTS, AND
PROPERTY AUCTIONEERS.

Offices: 5, Cook Street, Liverpool.

Telegrams—"ACRES" LIVERPOOL.

Telephones—187 and 188 CENTRAL.

Estates, Farms, Residential and Business Properties only.
Periodical Sales of Property at Liverpool, Chester and Preston

SHROPSHIRE.

SHREWSBURY, WELLINGTON WEM, AND OSWESTRY.
Messrs. HALL, WATERIDGE & OWEN,

Auctioneers, Valuers, Surveyors, and Estate Agents.

Offices—High St., Shrewsbury; Market St., Wellington;
19, High St., Wem; Bank Chambers, Oswestry.

Sales of Landed Estates, Residential and Business Properties,
Standing Timber, Machinery, Agricultural and Pedigree Stock,
and Furniture. Agricultural Valuers and Arbitrators.

Monthly Horse Sales at the Raven Horse Repository and
Trial Grounds, Shrewsbury.

All applications for Advertisements in

"The Journal of the
Board of Agriculture"

should be addressed to

C. VERNON & SONS, LTD.,

38, Holborn Viaduct,
London, E.C. 1.

'Phone—Holborn 5676.

THE POTASH SALTS OF ALSACE.

Sylvinite 14 per cent. (French Kainit)

Sylvinite 20 per cent. (French Manure Salts)

Muriate of Potash 50 per cent. to 60 per cent.

LARGE SUPPLIES ARE NOW AVAILABLE.

4,000 tons per day are being produced by the
Potash Mines in Alsace.

**THE ALSACE-LORRAINE
DEVELOPMENT AND TRADING CO.,
54, GRESHAM STREET, LONDON, E.C. 2.**

Sole Agents in the British Isles and Colonies, for Potash Mines of Alsace.

SCOTCH SEED OATS.

**Abundance, Beselers Prolific, Crown,
Hero, Yielder, Record, Newmarket,
Leader, Banner, Waverley, Rival Black,
Black Tartarian, Scotch Potato,
Early Hamilton, Victory, The Captain,
Tartar King, and practically all other
varieties.**

All from Selected Stocks thoroughly re-cleaned.

State varieties and quantities required and samples with prices
will be sent.

FARM SEEDS.—Ryegrasses, Clovers, Natural Grasses,

OF GUARANTEED PURITY AND GERMINATION.

Samples and prices on application.

AUSTIN & McASLAN, Seed Merchants, GLASGOW.

ESTABLISHED OVER 200 YEARS.

FIAT

HIGHEST AWARD LINCOLN TRACTOR TRIALS

The first official Tractor Trials were held at Lincoln from September 24th to September 27th, 1919. There were 57 entrants; representing 34 different makes. The FIAT Tractor obtained the highest award, carrying off (in six competitive events)

**TWO FIRST PLACES
ONE SECOND PLACE
ONE THIRD PLACE**

The event was thoroughly International in character, so that the supremacy of the FIAT Tractor is so pronounced as to render further comment unnecessary—except, perhaps, to add that the same success has just been attained in the Belgian official International Tractor Trials. The same measure of superiority obtains in regard to the FIAT one, one-and-a-half, and three-and-a-half ton commercial vehicles; and also in FIAT cars.

A full range of FIAT products will be exhibited at the

GLASGOW MOTOR SHOW

**JANUARY
23 to 31**

STANDS 15 & 24

FIAT MOTORS LTD., 5, Albemarle St., London, W. 1.

Telegrams: "Fiatism, Piccy, London."

Telephone: Gerrard 7946.

MODERN FARMING

*The Progressive, Practical-
... Farming Magazine ...*

“MODERN FARMING” is a magazine you will like. It is both brightly interesting and soundly practical. It deals with the science and economics of farming in a downright man-to-man way. Articles on subjects in which you are interested are regular features, written by men whose names are known and whose opinions are respected.

Steadily it is gaining a wide and influential circulation throughout the country as well as overseas on sheer merit and likableness.

Ask your local newsagent to obtain “MODERN FARMING” for you (3d.), or send 4s. 6d. for one year’s subscription (post free), or write and enclose 4d. for a specimen copy.

PRICE
3d.
MONTHLY.

“MODERN FARMING,”
ST. JOHN’S HOUSE,
MINORIES,
LONDON, E. 1.

CONTENTS for JANUARY include

Modern Farmers and their Work.
Welsh Black Cattle. By Parker Mackenzie.
Longhorns. By J. A. Frost.
Cheviot Sheep. By John Robson.
World’s Champion Barley. By Edmond Doyle and Thomas McGrath.
Varieties of Crops for Soiling and Silage. By J. C. Brown.
New Life for the Old Orchard. By E. M. Bear.
Stetch Ploughing with the Tractor.
&c., &c.